

REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority: N/A			
3. Declassification/Downgrading Schedule: N/A			
4. Distribution/Availability of Report: UNLIMITED			
5. Name of Performing Organization: Advanced Research Department			
6. Office Symbol: 35	7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207		
8. Title (Include Security Classification): "The ULAV Project:A Case Study in Innovation"			
9. Personal Authors: Raymond V. Anderson, CAPT, USNR			
10.Type of Report: FINAL	11. Date of Report: 02 June 2000		
12.Page Count: 166			
13. Supplementary Notation:			
14. Ten key words that relate to your paper: This thesis is aimed at continuing the discussion within the Department of Defense (DOD) and the potential impact it has on meeting our changing national security objectives.			
15. Abstract: The thesis central theme is that innovation is necessary for the success of military operations designed to support the National Military Strategy. There are, however, elements at work that restrict that restrict the innovative process. At best, they maintain a less cost efficient status quo. At worse, they may lay the foundation for our own defeat. The elements are internal, external and contextual. The dominant factors are the internal elements inherent to large bureaucracies like culture and structure. The second are influences external to DOD and include legislative and budget processes. Finally, there are contextual elements like war and peace environments that can influence innovation. The case study is drawn from an actual internally generated innovation to support United States riverine forces. The concept was eventually expanded to assist Participating nations (PN) in conducting counter drug operations in the United States Southern Command Area of Operations (AOR). The documented period is from 1991-1999.			
16.Distribution Availability of Abstract: A	Unclassified <input checked="" type="checkbox"/>	Same As Rpt <input checked="" type="checkbox"/>	DTIC Users
18. Abstract Security Classification: UNCLASSIFIED			
19. Name of Responsible Individual: Professor John B. Hattendorf Director, Advanced Research Department			
19.Telephone: 841-6020	20.Office Symbol: 35		

Security Classification of This Page Unclassified

20010314 068

The Center for Naval
Warfare Studies

THE ULAV PROJECT: A CASE STUDY IN INNOVATION

by
Raymond V. Anderson
Captain, USNR

DISTRIBUTION STATEMENT A

Approved for Public Release
Distribution Unlimited

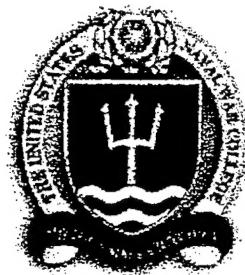


**Advanced Research Project
Spring 2000 - #3**

U.S. Naval War College



NAVAL WAR COLLEGE
Newport, Rhode Island



The ULAV Project: A Case Study in Innovation

By

Raymond V. Anderson
Captain, USNR

As an Advanced Research Project

A paper submitted to the Director of the Advanced Research Department in the Center for Naval Warfare Studies in partial satisfaction of the requirements for the degree of Master of Arts Degree in National Security and Strategic Studies. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or Department of the Navy.

Signature: _____

Faculty Advisor
Thomas G. Mahnken, Ph.D.
Associate Professor of Strategy



2 June 2000

Abstract of

The ULAV Project: A Case Study in Innovation

This thesis is aimed at continuing the discussion of innovation within the Department of Defense (DOD) and the potential impact it has on meeting our changing national security objectives. Its central theme is that innovation is necessary for the success of military operations designed to support the National Military Strategy. There are, however, elements at work that restrict the innovative process. At best, they maintain a less cost effective and efficient status quo. At worst, they may lay the foundation for our own defeat.

The elements are internal, external and contextual. The dominant factors are the internal elements inherent to large bureaucracies like culture and structure. The second are influences external to DOD and include legislative and budget processes. Finally, there are contextual elements like war and peacetime environments that can influence innovation.

The case study is drawn from an actual internally generated innovation to support United States riverine forces. The concept was eventually expanded to assist Participating nations (PN) in conducting counterdrug operations in the United States Southern Command Area of Operations (AOR). The documented period is from 1991-1999.

The Ultralight Aviation (ULAV) Project was an initiative to utilize low cost manned light aircraft to support force protection and operations. It was conceived to conform to the concepts and design of the Security Assistance (SA) Program. Theater Engagement

Plans (TEP) and existing doctrine. The founding rationale for the program was based on the principles of war as outlined in joint and service publications.

It is essential that if the United States is to maintain her global position in the increasingly demanding and diverse strategic environment, creative, cooperative and asymmetric problem solving through innovation will become a greater necessity for the DOD.

Acknowledgements

I would like to express my sincere thanks to Professor Thomas Mahnken, my faculty advisor. His belief in openly looking at issues and his personal, professional dedication to the subject has made my pursuit of this project both possible and satisfying. I also wish to thank the following for their time and their perspective on the issue: Dr. Barry Posen (Massachusetts Institute of Technology), Dr. Steve Rosen (Harvard), DR. Owen Cote (Massachusetts Institute of Technology), Mr. John Pennella (Counterdrug Technology Development Program Office), LtCol Thomas Ehrhart (USAF, Air Staff) and Mr. Robert Williams (US Southern Command Washington Directorate).

This project would not have been possible without the personal and professional support of my wife and partner Fran. Her understanding of my passions has made my life very good.

Table of Contents

I.	Introduction	1
	Research Problem	1
	Hypotheses	2
	Scope	2
	Assumptions	2
	Key Terms and Definitions	3
II.	Theoretical Background	5
	A. Military Innovation Theory	6
	B. External Elements to Innovation	17
	C. Contextual Elements to Innovation	20
	1. The Natural Environment	20
	2. Nature of the Innovation	21
	3. Timing	21
	D. Internal Elements to Innovation	26
	1. Cultural	26
	2. Organizational	28
	3. Human Nature	37

III.	ULAV Case Study Narrative and Analysis	44
IV.	Conclusions and Considerations	88
	A. Leadership and the Organization	89
	B. The Innovator	94
V.	Appendices	104
	Mr. John Pennella's Interview	105
	LtCol Thomas Ehrhard's Interview	110
	Mr. Robert William's Interview	115
	Dr. Barry Posen's Interview	120
	Dr. Owen Cote's Interview	128
	Dr. Stephen Rosen's Interview	137
VI.	End Notes	144
VII.	Bibliography	151
VIII.	Vita	159

Introduction

Statement of the Research Problem

This study will examine selected internal, external and contextual elements affecting the innovation process within the Department of Defense (DOD) and then relate those elements to the ULA V Project.

In discussing the research problem, the concepts of organizational and military innovation theory will be applied to the elements affecting the innovation process. The focus will be on describing the above components and relating them to actual events.

The internal elements affecting the DOD innovative process are the most numerous. They occur at some point within DOD where an innovation has been introduced. These elements will manifest themselves as systemic organizational barriers to change. The external elements are processes and systems instituted outside of DOD in the form of policy and legislation that can strongly influence or direct innovation. This also includes a host of government and non-government civilian personalities. Contextual elements describe the landscape in which the innovation is conceived. It consists of time, science and the geopolitical environment. These factors are givens. They are the least influenced by the innovator or leadership in determining innovative outcomes. But their effect can be profound when combined with external or internal elements.

By analyzing the ULA V Project in terms of each of the above elements, it is hoped to provide some further insight for innovators in their struggle to change the DOD on one hand and an organization's affinity to preserve the present condition on the other.

Hypotheses

It is my hypothesis that internal, external, and contextual factors often conspire to stifle innovation. Of these, internal constraints are the most formidable. To be successful, both the innovator and leadership must develop strategies to overcome the inherent difficulties of instituting change in a hierarchical system rigorously designed to limit uncertainty.

Scope

The study will be limited to a narrowed set of elements affecting the DOD innovative process. It is not an all-inclusive list. Certainly, many other sets of circumstances, events and organizations could create some additional elements.

This study will not provide a checklist for success or a plan for restructuring the innovation process within DOD. It is hoped, however, to make both the leadership and the innovator aware of how to more effectively approach the process. To do that, the study will be focused on the ULAV Project as a potential innovation vying for a position of acceptance in DOD. Finally, this study will not attempt to validate the ULAV concept or requirement.

Assumptions

The first assumption is that change as a result of invention-and innovation in the DOD is inevitable. This in no way implies that neither DOD will adopt the right innovations at the correct time and place in history nor does it assume that DOD will initiate those changes. Change in DOD is the result of a dynamic and competitive environment.

Implied in the first assumption is that DOD's leadership can innovate if it desires to do so. The scope of that change is dependent on the influence and resources at the discretion of innovative leadership. A potential corollary is that both leadership and innovators can, at some level, affect the outcome of innovation by considering the internal, external and contextual elements in an adoption strategy. As an innovative leader moves from his sphere of influence and resources to another, he is not totally at the mercy of the elements. He has some room for maneuver at his disposal. The process of innovation in large military organizations through history has met with similar obstacles and from these general teachings we can conceive some imperfect strategies.

Key Terms and Definitions

Evolution refers to the process of incremental improvements of an existing system. This could be applied to training, organization, doctrine or a weapons platform. Evolutionary improvements generally improve some level of effectiveness or efficiency.

Invention is a device, concept or process originated after experimentation and study. An invention's existence has no potential value without proposed applications. Inventions become innovations when transformed into a socially usable product.

Innovation is the successful application of invention into a process, organization or system. Innovation is exploited invention. Innovations may lead to evolutions and even revolutions within the DOD.

Revolution as in a revolution in military affairs (RMA), may be preceded by a technological advance that allows the military to fundamentally change the way weapons, logistics and communications are conducted. It may change the way forces are organized.

Military force is the extension of politics by other means. Its application is intended to change an opponent's will. The test of an RMA is the effect it has on the mind of an adversary. If an RMA has occurred, it has made possible a new range of political outcomes for the force introducing this change.

Intrapreneur is "Any of the dreamers who do. Those who take hands on responsibility for creating innovation of any kind within an organization. The intrapreneur may be the creator or inventor but is always the dreamer who figures out how to turn an idea into a profitable reality." ¹

Entrepreneur. "Someone who fills the role of an intrapreneur outside the organization." ²

Theoretical Background

The innovation process is fraught with power, politics, science and intense human emotion. The Department of Defense (DOD) works within these environments with the added responsibility for life and death.

There is a backdrop that the reader must keep in mind as he or she moves through this paper. Military innovation theory is a subset of organizational theory. Forces described in organizational theory shape the motivations of an organization. Salient points of organizational theory and their arguments will be introduced as they relate to the innovation process. It is not within the scope of this paper to address the vastness of organizational theory.

The innovator's motivations are only partially shaped by the organization. Innovators and innovative organizations think and act divergently. They have a willingness to abandon what they are. Conversely, bureaucracies tend to think inwardly or convergently. Bureaucracies look inward to refine what is. As surely as time and water shape the face of the earth, change is inevitable. If we are not changing, we can be absolutely sure others are. The motives of innovators may be organizational, financial, philanthropic or self-aggrandizement. The danger for the DOD does not come from our own intrapreneurs, but from our potential adversaries.

Finally, innovation is not a static discussion about how DOD will proceed. The world is a dynamic geopolitical environment. The speed of advance of technology and knowledge along with the increasing ability to diffuse material is significantly altering the world. The implied counter argument behind this paper is how will a potential adversary

seek to exploit the innovation landscape of this changing environment or defeat our innovation strategy?

Why does man feel obligated to innovate, a need to achieve? "Bernal Diaz speculating about the motives that had driven him and his like to the Indies, wrote that they had left Europe to serve God, his Majesty, to give light to those who were in the darkness and to grow rich as all men desire to do."³ Missions or crusades are motivators and so is survival for those on the receiving end of ambition. In an effort to counter early western powers at sea, non-European people began to westernize. As M. Chang wrote, "since we were knocked out by cannon balls, naturally we became interested in them, thinking that by learning to make them we could strike back."⁴ The nucleus of innovation may be an individual or a small group that grows over time. The proponents of innovation seldom find themselves in concert with an existing organization. It is in the diversity of motives between individuals and the organization that military innovation must compete.

Military Innovation Theory

J. L. Adams wrote: "The natural tendency of organizations to routinize, decrease uncertainty, increase predictability, and centralize functions and controls is certainly at odds with creativity."⁵ Certainly war is man's riskiest organized endeavor. It puts in jeopardy both individual life and the survival of the state. The environment of war is unpredictable. It should not be of surprise to anyone that civilian and military leaders would want to create very rational organizations that limit the most uncertain environment of all, war.

The organizations we most commonly think of as actively engaged with uncertainty are businesses. Their success or failure is measured according to a bottom line derived from

competition. Business organizations ebb and flow in a chronic economic conflict and moderate volatility. The military, on the other hand, is subject to acute but infrequent tests of its primary tasks.

An organization's ability and method of dealing directly influence the process of innovation with uncertainty. Jay Galbraith defines uncertainty as a difference between the current organizational knowledge and the information that will be required to accomplish a task.⁶ Organizations are conflicted by uncertainty internally by task and externally from their operating environment. There are five ways Galbraith concluded that an organization could address this uncertainty and return the organization to its original or a new state of equilibrium. He expressed these as information volume passed and responded to over time. Greater uncertainty meant more questions and answers and an increasing load on the organization. Information volume is good, but should also be extended to activities other than communication.

The first is to change the operating environment. While our national security strategy is in part based on shaping the environment, the US Government historically has only been able to force, convince or buy cooperation for short periods of time. Given the variables of the world environment this approach has limited application for the DOD.

Second, an organization can reduce its level of performance. This creates some excess capacity from reduced workload. DOD could do this if it thinks of performance as both capabilities and operational tempo. A reduction in operational tempo may create some "slack" without a reduction in real capabilities.

Third, an organization can create autonomous, self-contained units to complete its part of a task. DOD has in a sense done this with separate services and individual service budgets. An independence of action may be more efficient than the whole.

Fourth, technology can provide faster movement of knowledge vertically within the organization with better direction to the key people. This is a real possibility for the DOD and a current focus of interest.

Finally, the organization can decentralize, share information laterally, create alliances and partnerships and make decisions at lower levels. In any event, task information requirements and the capacity of the organization to process information are always matched.⁷ If an organization fails to respond to uncertainty, reduced performance will automatically occur.

Through these Galbraith has provided some insight for our innovative approaches by giving us a look at organizational behavior in the face of uncertainty. An innovator can use this information in planning acceptance and implementation strategies.

The Sources of Military Doctrine by Barry Posen looked at how changes in military doctrine occurred. By examining the inter-war period and the French, German and British doctrine for the Maginot Line, Blitzkrieg and air defense, respectively, Posen applies a "perspective" to Organizational theory and Balance of Power theory. Each is evaluated in terms of offense, defense and deterrence as well as integration and innovation. Posen asserts of military organization and innovation:

1. Because of the process of institutionalization, which gives most of the members of the organization a stake in the way things are, doctrinal innovation will only rarely be sponsored by the organization itself.
2. Because doctrinal innovation increases operational uncertainty, it will rarely be sponsored by the organization itself.
3. New technology, when it has not been tried in combat, is seldom by itself a catalyst of doctrinal innovation.
4. A client state's combat experience with a new technology may spur innovation.
5. Direct combat experience with a new technology can cause innovation.
6. Failure on the battlefield can cause doctrinal innovation.
7. Civilian intervention can cause military innovation.⁸

These are very pessimistic conclusions concerning the willingness of the military to innovate. This realist approach folds well into Posen's follow on hypotheses for balance of power theory that concludes "Generally anything that increases the perceived threat to the state security is a cause for civilian intervention in military matters and hence a possible cause for integration and innovation."⁹ Of the three cases examined, Posen says: "We see very little internally generated innovation. The military organizations seem not to like innovation."¹⁰ The RAF was formed by civilian order, Hitler forced the development of Blitzkrieg and the French dramatically shifted from an offensive to defensive strategy after WWI with a great deal of involvement of civilian leadership assistance. Military organizations innovate more readily when poked with a sharp stick in the eye from an adversary or their civilian leadership.

Stephen Rosen's approach to military innovation in Winning the Next War is through a lens of peace, war and technological innovation. By reviewing cases before and after World War II, he provides insight into the fiscal, political and informational aspects against a broad array of innovations.

Rosen's expanded view argues the relative success of innovation around time, money and knowledge. "Peacetime military innovation occurs when respected senior military officers formulate a strategy for innovation, which has both intellectual and organizational components. Civilian intervention is effective to the extent that it can support or protect these officers."¹¹ Peacetime innovation is generational. It takes decades not years. Mid-grade officers who recognize a change in the strategic environment initiate the change. As they attain senior status in their profession with solid credentials, they can foster and protect those in their wake, building horizontally and vertically within the organization. This includes promotion paths, command and training. These kinds of sweeping changes are divisive and contrary to the static desires of the military organization. Naval aviation and amphibious warfare are good examples of successful peacetime innovations.

In Rosen's view "Combat provides, rather than speculative arguments, clear justifications for jettisoning old ways of fighting and adopting new ones."¹² While war gives a military a pretty clear view of what not to do, it creates a clouded view of what has to be achieved. Wartime innovation is real world experimentation. With it comes the need for a method to process and evaluate information. Reorienting the organization takes time and

even successful programs like fighter escorts and tanks were not available until the end of World War II.

Rosen notes that wartime innovation is less dramatic than peacetime innovation. By its nature, it is reactive and not thoroughly conceived. Wartime innovation is an imperfect process that is forced to incrementally improve itself at the expense of limited resources. Rosen concludes that the learning curve in wartime is "extremely difficult".

Maybe it is because of the difficulties in this survival learning and implementation process that Rosen finds the peacetime innovations the most successful. In peacetime, military innovation is in a convergent organization trying to make divergent decisions. In war, a centralized military is participating in a divergent action and trying to do divergent thinking. Normal organizational behavior is convergently focused (looking inward) seeking to refine what it already does and results in evolutionary change. The innovation process which is outcome focused (divergent) is in a conflict with this. Wartime events make the innovative process more uncertain and can complicate it even more.

Owen Cote looks at the constituent parts of an organization. These are areas that manage peoples' lives. They consist of training, promotion and the separate sub-cultures in the services. Cote views innovation as either insurgent, threat based or insecurity between the services.

Cote, who draws on the work of both Rosen and Posen, sees the lack of a clear threat and an unwillingness to decentralize and compete the services against one another as the current threats to innovation.¹³ Conversely, threat and competition promote innovation.

In the creative destruction that is innovation, Cote sees three motives for innovative change within DOD. The first is an insurgency from within. This is a peacetime event that takes time. It is like the story of Naval Aviation. In the Navy, LCDR Mustin was writing about carrier air strikes between 1915-1917 while commanding the flight school at Pensacola. It was not until 1944 that the concept of a carrier strike force materialized. Most of the carrier aviation innovation took place between WW I and the beginning of WW II. There was no clearly defined enemy. There were budgetary constraints and competition between airplane and the battleship communities. It was the patient and persistent effort of key figures each exercising measured influence over time that removed obstacles. This included war gaming, operational testing, protection and promotion of officers.

The second is threat based. The decisions are made under time constraints and an environment of fear. Politicians (powerful people) have looked around and realized the military is behind. The dangerous change in the environment has been realized. It is a rational process but not the basis for innovation you want to embrace. This is a wartime scenario.

The last is the uncertainty between the services. It is expensive and messy to have the services competing. This process does promote more effective innovations in a more rational environment. Ballistic missile development after WW II is a good example. There was great uncertainty about the use, deployment and basic science of ballistic missiles. This uncertainty fostered JCS memo 1620 in late forties, which emphasized knowledge over procurement and the desire of competition and duplication. The JCS had decided to put off ownership of any missile program and to hedge their bets when confronted with uncertain

futures. This competition ran through the mid-fifties and led to numerous additional innovations by the services.

Vincent Davis, the author of the Politics of Innovation, adds the internal dimension of innovation. Davis follows three post-WW II and several pre-WW II cases in the Navy (Between 1900-1960). The Navy view up through WW II was one that discouraged outsiders. It felt that no one understood the Navy like the Navy and its problems and solutions would come from within. This created two interesting features. The first, the Navy encouraged horizontal lines of communication unlike the Army, which emphasized a strong vertical component. This horizontal dialogue allowed for the exchange of ideas and the formation of alliances that are the starting point of innovative insurgencies. This in a sense created some decentralization, which is more conducive to innovation. The second was the Navy had to have an expectation that their own personnel would bring forward solutions to problems if outside resources were not going to be solicited. This may account for Davis's assertion during this period that the Navy benefited from the "innovation advocate" that came from within. He and his strategy are characterized as well as his opponents. The innovative advocate will be discussed later as an internal element.

In The Politics of Naval Innovation, where the cases of Aegis system and the Tomahawk cruise missiles are discussed, the authors cannot make a distinction as to whether Posen (external civilian initiated), Rosen (internal top down) or Davis's (internal from the middle up) theories on the source of innovation were identifiable. This is an example of the art of the innovative process. Innovation in the military and civilian sector is composed of themes, rather than hypotheses that repeatedly prove themselves. The

implication and warning to the innovator is that the influence and value of any element may vary greatly from situation to situation. As an example, the British and the United States both had fledgling naval aviation after WW I. The varying nature of internal, external and contextual factors on two similar innovations resulted in success for the United States and Great Britain.

Looking back at what organizational changes have taken place to adopt an innovation. is another way of identifying the essential elements of an innovative strategy. Robert Yin noted that key events in organizational change accompanied acceptance of an innovation. " ...we have thus begun to identify key organizational events-- what we have called passages and cycles have been identified, and they include: equipment turnover, transition to support by local funds, establishment of appropriate organizational status, establishment of stable arrangement for maintenance and supplies, establishment of personnel classifications or certification, changes in organizational governance, internalization of training program, promotion of personnel acquainted with the innovation, turnover and key personnel, and the attainment of widespread use. Our argument is that innovative practices become institutionalized when such passages have been achieved or cycles have been survived."¹⁴ These cycles and passages are the supporting objectives of a strategy to inculcate an innovation. They are also very much in concert with Rosen's work.

As important as the cycles and passages in measuring innovative success, are the traits of an organization willing to make the move in the first place. Evangelista and Sands in separate works identified five characteristics that affect organizational innovation.

1. The degree of centralization of power and control will help determine capacity for innovation. Centralized organizations have a tendency to inhibit the generation of ideas. This is a characteristic of military organizations. The positive side of centralized power makes implementation of an idea much easier.
 2. The complexity of the knowledge possessed by the organization's members can determine its ability to change. Sophisticated organizations encourage change by having the knowledge to create solutions.
 3. Formalization of the rules and procedures for the membership of an organization affects the chances for new concepts and ideas. The more formalized the operations of an organization the less likely innovation will occur. DOD is welded to standard operating procedures (SOPs).
 4. Interconnectiveness is the degree of diffusion of new ideas the membership can attain by networking. A freedom to pass information freely, horizontally and vertically, facilitates innovation. It allows not only information to be passed, but can be the avenues through which alliances can be built.
 5. Organizational slack is the availability of uncommitted resources. Organizations that can dedicate or reallocate time, money and resources to a problem are more likely to create solutions.¹⁵
- The conclusion derived from these is that DOD is a pretty good organizational structure to implement an idea. Given a task and the additional knowledge to perform the task, DOD is effective. But as a source of innovative generation this is another matter. Innovation needs to be in a decentralized environment, with smart people that can freely

talk to each other, the fewer the rules the better and some modest level of resources to play with. This would suggest that military innovation needs to be part of DOD, but structured independently to foster the creativity necessary for real change.

Bruins, in his study of Naval Bombardment Missiles, noted "Trigger Events". These dramatic events align an organization's perspective and change the personal filtering rules of an organization.¹⁶ It is these events that may change the strategic perspective of the innovator and lead him to conceive of Rosen's "new theory of victory" and force the ensuing ideological struggle within a service. The struggle results in "new, concrete and critical tasks" that reshape the organization and the distribution of its resources. This includes new paths to power, career and promotion opportunities.

There is an opposing question to be considered. The question would be "What are the predictors of another country's military innovation?" The implication being that we might ascertain whom our future innovative adversary might be based on a set of indicators. Predicting Military Innovation examined the cases of Vietnam, the Israeli Defense Force and the Chaco War for military effectiveness as a measure of innovative success.¹⁷

The study examined the four dominant perspectives on innovation. The Structural Realists see geopolitical competition as the prime mover. In the Societal view, theorists see the cohesiveness of a society as necessary to sustain effectiveness. Organizational models look at the internal and external influences on military innovation. Cultural outlooks encompass a state actor's strategic pattern of force and civilian/military decision making.¹⁸ None of these can stand-alone. Together, they are like a transparent deck of cards. They are known, but you do not know their order and precedence.

The conclusion was that there were seven factors " that are particularly relevant to military innovation: high external threat, revisionist aims, relative resource constraints, societal cohesion, past failure, product champions and career paths."¹⁹ But the value of this information is limited by the direction provided in a military strategy and the resource components of the proposed innovation.

Emily Goldman mentions three of these factors again in looking at peacetime innovation from an organizational learning perspective. "Three factors are key to reducing ambiguity: domestic political inducements; international vulnerability; and credible knowledge that support the proposed innovation."²⁰ Once again there are reoccurring themes that manifest themselves in a variety of perspectives.

As part of this study, interviews were conducted with Dr. Rosen, Dr. Posen and Dr. Cote. Interviews for this research also included three individuals who work within the DOD affiliated with contemporary issues facing the innovative process. They are Mr. Robert Williams, Mr. John Pennella and LtCol Thomas Ehrhard. Biographical notes and interview information is contained in the appendices.

This paper now examines three broad areas affecting the rise of any innovation. They are the internal, external and contextual elements described below. There is no attempt to prioritize any of the sub-elements and certainly the list is in no way complete. In some cases, it could be argued that some the issues could be categorized under more than one element. The organization of this list into three areas, does in general terms, show more issues internally, fewer externally and still fewer contextually. This may be as indicative of greater opportunity as an impediment when you consider the increased number of

approaches in the internal environment to introduce an innovation. This division can also be considered as moving from areas of greater to lesser control for DOD or the innovator.

External Elements

External elements are those organizational influences outside the DOD that influence the innovation process. "Outside" in that policy and law bind the DOD innovation process. Above all, the DOD is a bureaucracy subordinated to bureaucracy. The President and Congress are frequent, powerful influences on the direction and shape of the armed services. Because the President and Congress are subject to the pleasure of the people, other players can exert their power on the military. These include the media, public opinion and business interests. Examples of this external influence can be seen in our "casualty avoidance", V-22 Osprey program and gay policy issues. Most civilian influence is managed by the President in the National Security Strategy and Presidential Decision Directives (PDDs) or by Congress in the form of law. The DOD responds with changes in its own policy as a response. These influences create processes.

Processes. The Department of Defense's size and complexity has led to specialization and rigidity. The Goldwater- Nichols Act attempts to bring things together at the request of civilian authority. The process concept is "Jointness".

Jointness as an innovative process has mixed reviews. Stephen Hill notes "Joint STARS highlights the difficulties of joint system development and the difficulties of developing innovative systems that do not meet traditional service missions. The difficulties are due to the fact that the services, and even the different operating commands, often have deeply held beliefs about operational, doctrinal and technical characteristics of their systems

and programs. Attempts to force changes in these deeply held beliefs in the name of jointness is very costly and ineffective."²¹ The nexus of points where soldier, sailor, airman and marine come together is very small and the process has no clearly defined boundaries organizationally or individually.

Jointness has two basic followings. One group is more intent on the efficiency of the services and the elimination of duplication. The other side seeks to improve effectiveness through integration of the force components. Has the venture reduced uncertainty for the individual services? If it has, is the innovative process enhanced or inhibited? M. T. Owens points out both arguments. "Jointness as integration also spurs competition, which in turn stimulates innovation. Small, competitive organizations seem to provide the most fertile soil for generating and implementing new ideas. By coalescing around a variety of strategic concepts, the individual services generate the institutional capacity for adaptation and innovation." The preservation of the services and their overlapping capabilities permits them to compete with each other on issues. There is a built in second opinion. The counter argument "Its critics argue that far from spurring innovation, the separate services resist it because of bureaucratic inertia, intellectual orthodoxy and institutional rigidity."²² This efficiency or unification position assumes that there is a technological silver bullet and that our vision of the future is correct. The truth lies somewhere in between. At this point in time, with no clearly identified threat or external pressure, the services are more likely cooperating than competing. Innovation is not served best by this Joint environment.

Cote says, that since the boundaries (between the services) have been agreed upon and the incentive to innovate aggressively diminished, it is Collusion versus competition.²³ Before jointness was imposed and there was an external threat, the services competed for positions of power very effectively.

Other processes that are adopted by or thrust upon the DOD add to the inertia and in many ways compound the problem. The Requirements Generation System (RGS), the Planning Programming Budgeting and Execution System (PPB&ES), federally funded research facilities and the Joint S&T structure are not vibrant. They are designed as permanent life support. John Grin puts forth that "...military R&D was traditionally driven, or at least legitimized, by the situation of confrontation. Since technology development processes, like any major institutionalized human activity, are characterized by substantial inertia, this is not likely to change all by itself. An explicit effort will be required to re-orient military-technological innovation to bring it in line with the demands of the new security situation."²⁴

The Joint Resource Oversight Council (JROC) is a Title 10 requirement that caters to incremental and evolutionary approaches. The JROC further sustains cultural footholds and platform centered solutions in the DOD by focusing on acquisition category (ACAT) I and IA programs. If procurement is less than 2.135 billion dollars for ACAT I, the designation authority is the service secretary and is not part of the JROC's tasking. The council's charter states as a first goal the identification and priority assessment of joint military requirements (including existing systems and equipment). If one looks at the current Major Defense Acquisition Programs list, we see the majority of line items are

incremental improvements and recapitalization programs. These are decisions made against projected bottom lines. Owen Cote stated that the JROC was a nice experiment, but does not work.²⁵ The failure of the JROC is a shared responsibility. The services forward platform based agendas. The JROC only involves itself at the high end of the requirements and acquisition process. Smaller innovations that might allow a service to more effectively get inside the operational loop of an adversary in a more timely fashion are not suited to the existing process.

Contextual Elements

Contextual elements are time, space and the laws of science. There are three areas of discussion that include the nature of the innovation itself, timing with events and the effects of the natural and scientific environment on the proposed change.

Natural and Scientific Environment. Science, nature and the operating environment are the basic obstacles for inventors and innovators. They dictate the Technical Service Orders (TSOs) and ultimately establish the ground rules for many innovations. Boats, as we know them today, will not operate without water, aircraft design will be governed by the principles of aerodynamics and the capabilities of manned vehicles are limited by the natural limitations of man. The good news is that much of this is known and continues to be quantifiable. With few exceptions it will change in a very slow evolutionary process. It is part of everyone's innovative burden.

Nature of the innovation. The nature of the innovation can play a significant role in the acceptance of an idea. An industry that machines parts for clocks is not as likely to consider even the most brilliant quartz movement concept. Kodak had the first shot at

copiers, but failed to see it as an opportunity because of how they saw themselves. The clock makers had to think of themselves as time keepers and the people at Kodak needed to think of themselves as imagers. If the concept fails to fall in the boundaries, real or conceived, for an organization it is likely to fail.

The nature of an innovation also carries with it a level of uncertainty. Like the examples above, not only does the organization have to have a vision of themselves to have a capability, but there must be a capability to respond by investment and research. Graham Ramsey writes "...like every other innovation in warfare, it contains its own weaknesses and vulnerabilities which can be exploited by a knowing foe. After all, a force which relies on technology is easier to defeat, using technology, than one which does not."²⁶ To commit to another way of doing business may open more opportunities for your adversary to successfully compete with you. For DOD, without a vision and some level of capital the perceived level of uncertainty may be too high and implementation may be affected.

Timing. All events are governed by the most valuable and unrecoverable resource, time. Timing can affect innovation in numerous ways. No matter what you want, it may not be practical until other advances are made to support the innovation. Cannon development was at the mercy of the art and science of the foundry, although the concept was well established.

Fernand Braudel's concept of time and the RMA considers the effects of time on innovation from near and far term. It is temporally based and the cumulative and combined innovations and evolutionary changes constitute the backbone of the RMA. Fernand Braudel's injunction was that no complex social phenomena could be grasped without

Surprise. No authority on the subject of innovation denies its effect or its propensity to appear. It crosses all the elemental boundaries.

Jan Van Tol remarked "The presidency of the Naval War College, the post of chief of the Bureau of Aeronautics and the commodore's role as head of fleet aviation squadrons is what gave Sims, Moffett and Reeves an arena to interact professionally."³⁰ Who would have conceived that these three men would be at the right place and time? What divine hand ordained an international treaty that would drop the Lexington and Saratoga in naval aviation's lap? Like many things in life it gives one pause to consider the expression "I would rather be lucky than good".

Another aspect of timing that is of real concern for an innovator in the DOD is movement of key decision-makers in the process. Large platform communities have incremental processes that span careers. These long-lived programs have achieved continuity through organizational acceptance. They have program codes for budgets, are part of the supply system, established communications channels and have trained personnel that are recognized for promotion. New innovations fighting their way up have to build networks from smaller groups that turn over quickly. An advocate may be replaced with an adversary or the process of salesmanship will have to be repeated to maintain links with alliance partners.

Time and speed are linked. The speed of innovation is increasing. DOD's ability to make better and faster decisions against numerous adversaries may not be. As introduced earlier, the backdrop for a DOD innovation strategy is the world. Much of today's knowledge and innovation is not protected by national security. The spread of information

and subsequent innovation has to be a consideration in determining the degree of aggressiveness for our strategy. In discussing the effects of the diffusion process of an innovation, Emily Goldman believes it is essential to understanding the strategic advantage gained. " Diffusion has been a rarely uniform process." " The spread of innovations has been accelerating over time and there is little reason to think the trend will be reversed. The result has been a steady decline in the amount of time that the state that first leverages the innovation can expect to maintain a monopoly on the methods." "Finally, hegemons have historically been slow to adopt new military technologies and methods and consequently experience a decline in influence when revolutionary new military methods emerge and diffuse."³¹ In summary, it is unlikely we will be able to clearly define where the threat may come from. The advantage gained by initial use of innovation may be short lived. Pearl Harbor may repeat itself. The availability and proliferation of innovation as it increases over time will likely create greater uncertainty for the DOD. This may be reason (threat) enough to invest in new futures.

Internal Elements

The last of the categories, internal, consists of cultural, organizational and human nature. This area constitutes the military innovator's backyard. It is the place of opportunity and the source of greatest resistance.

Cultural. Mariann Jelinek states that "Much of what an organization knows is not codified or formalized; instead, it is part of the culture, part of what is understood." ³² Part of what any of the services bring to a discussion with one another is a perspective. Custom, tradition and the working environment shape this view. The down side is when the culture cannot see itself performing outside what it perceives as its life style. Aircraft, tanks and submarines made military organizations change their cultural perspectives. Paul Cook, founder and CEO of Raychem Corp., comments on what are the biggest obstacles to innovation. "For an organization to remain innovative, it has to be willing—even eager—to obsolete itself as fast as it can. So one of the biggest obstacles to successful innovation is success itself. All too often a company will develop an important new product and spend years asking itself the same questions—how can we make it a little better, a little cheaper, a little more sophisticated? Those are all-important questions; there is room for incremental improvement. ... A truly innovative company never stops asking more fundamental questions about its most successful products. Are there whole new ways to solve the problem?"³³

Service conflict is a cultural institution within DOD. "The allocation of military functional roles and missions has been a focal point of service rivalry since the Unification

Act of 1947. This appears inevitable when three and a half proud and powerful services vie for responsibility, influence, and status within a single strategy which is either the product of reluctant compromise among the Chiefs of Staff, or a concept imposed by the CJCS and his civilian superior upon acquiescent or dissenting Colleagues." ³⁴ This statement is not in conflict with a previous assertion that the services are not competing as they have in the past. It is part of the historic dynamics that occur between differing service interests.

Subcultures play an important role in innovation. There are at least three navies in the US Navy: surface, subsurface and air. Each originated from a common naval culture but are bound by the rules of their tribe. This results in further specialization and the opportunity to have multiple activities working simultaneously on incremental programs of increasing cost. General Israel, the former head of the Defense Airborne Reconnaissance Office, was charged with overseeing development of unmanned aircraft in the services. He was constantly in conflict with the dominant manned aircraft community who saw the UAV as a direct threat to them. Said Israel "Critics determined that the best way to slow down a bold and innovative idea was to load it down with cultural innuendoes and inaccurate comparisons between manned and unmanned aircraft." ³⁵

Competition between these communities for preserving the subculture is real. In discussing the arsenals ship, Admiral Owens said "They aren't bad guys. They aren't trying to make bad decisions. Their thinking is kind of. This is what we are accustomed to, we know how it works, and to break the mold is dangerous....I think that not breaking the mold is dangerous."³⁶ This organizational feature is focused inward and on the continual improvement of what is rather than what could be.

Thomas Ricks notes: "Unpopular programs fall victim to the Pentagon's longstanding aversion to the risk of failure." ³⁷ If a nation's armed forces fails, the nation and a way of life may cease to exist. The DOD holds itself to high standards. These standards and performance are under the constant scrutiny of the world. If DOD is given the choice between the accepted norm and a possible efficiency, the tendency is to leave well enough alone. If this failure aversion is tied to an administration policy, as in the case of casualty avoidance, there may be even greater reluctance to act as necessary.

Organizational. It was not until the industrial revolution was in full swing that the German social scientist Max Weber began studying why individuals would subordinate themselves to the commands of others. Weber put forth there were three types of legitimate authority. ³⁸ As he channeled his efforts to the rational model, he sought to identify the components of an ideal organization. His solution was the "bureaucracy" that he described as having "Precision, speed, unambiguity, knowledge of files, continuity, discretion, unity, strict subordination, reduction of friction and of material and personal costs- these are raised to the optimum point in the strictly bureaucratic administration". ³⁹ All too often Weber's ideal is by today's standards not synonymous with a "bureaucracy". From its inception, the bureaucracy is by design contrary to change. It depends on the realm of the known and repeatable. In 1972, Charles Perrow in his book, Complex Organizations: A Critical Essay examines the limitations and values of the bureaucracy. The message to the innovator is clear. "... he points out that bureaucracies are only optimal when "the tasks people perform are well understood, predictable, routine and repetitive..."

⁴⁰ These obstacles are structural in nature. They are the result of systems established and

maintained by the bureaucracy. They may have a direct or indirect impact on the innovative process.

A personnel system that has the ability to put the right person in the right place at the right time greatly enhances the prospects of innovation. Turnover and availability of personnel are one of Rosen's issues. You need to train and experience young people (the more malleable and flexible) and inculcate them with this perspective on the new innovation.⁴¹

People are the keys and conduits for change for the innovator. The networking process builds a constituency. People have resources at their disposal and the gates to power can be opened through personal contact. Innovation is far from being a sterile engineering environment. It is very personal. The rapid turnover of personnel in DOD often breaks established relationships in positions necessary for the innovator to proceed. This fact was recognized by Admiral Moffett's twelve-year assignment to the Bureau of Aeronautics.

Information sharing is another detractor for innovation within the DOD. Some of this was justified in the past when major developments were held close to the vest for national security reasons. "When the military is technologically ahead, there is some requirement for such procedures, both to protect the emerging technology and to ensure that projects remain on track and thereby safeguard taxpayers money. When however, technology can be bought 'off the shelf', such procedures only provide an opportunity to allow potential adversaries to get ahead."⁴² Innovation suffers in this environment as well.

The creative spirit likes to wander. It draws ideas from multiple disciplines and comes to a conclusion by rational imagination.

The mentors and evaluators necessary for innovation are few in numbers and access to them for developing concepts is difficult. We do not grow or import the innovative talent, as industry is able to do. As Rosen asserts that does not mean we do not have it. Talent is consumed by high operational tempo. There is not the time or the incentive to take the time for experiments and to work with doctrine.⁴³ DOD puts its best people in the business of preserving the present. They seldom venture far from their professional, cultural confines. How many innovative leaders have taken the time to think about some of William Miller's basic questions for an innovative organization and have the time or resources to implement them?

"Who are the best initiators of new ideas in your organization, and how do they work best?

What trends and events reflect threats and opportunities facing your organization from the outside?

In your organization, what are the steps that an idea goes through from its birth in one person's mind to its actualization as a product or service?

What hierarchical structures, operating policies, and other factors encourage or extinguish the proper level of risk taking and output?

How well is the process of organizational change strategized and managed to promote improved productivity and employee satisfaction?

What is the purpose of your organization in the long term?"⁴⁴

It is a task of enormous proportion to create innovation from the bottom up within DOD. In spite of a wealth of organizational talent and resources, grass roots level innovation is not apparent. The case of naval gunfire at sea detailed by Morison in Men, Machines and Modern Times, required an appeal to higher authority to institute change. It also highlighted Alfred T. Mahan's belief that no service could or should endeavor to reform itself. Theoretically, anyone can submit a requirement in the form of a MNS. The requirement must be judged and forwarded by the same group that may be most affected by its consideration and those who seek to apply a school solution within their organization. Their criteria and objectivity for evaluation are subordinated to the current organizational perspective. Posen, Rosen and Davis do not see innovation in DOD as a bottom up process. Cote goes so far as to say that individuals do not innovate.

Poor metrics and testing are characteristics of weak application and implementation of innovation. Peter Drucker stated "Decisions to develop a weapon with specific characteristics, to procure it, and to use it in a certain way in combination with other forces, according to a doctrine that governs its deployment are fraught with uncertainties." ⁴⁵ The real value of an innovation can remain elusive for years. The machine gun is a good example. The French mitrailleuse was considered a failure during the Franco-Prussian War of 1870-1871 because it was employed as a piece of artillery. Subsequent use of similar weapons in the Boer War 1899-1901 and the Russo-Japanese War 1904 -1905 provided mixed reviews. It was not until the Great War of 1915 that uncertainty was removed. Had the weapon been evaluated as high volume infantry fire and not as low volume artillery, it

may have taken less than forty-five years to optimize its use. Other examples include the Sherman tank and the M-16 rifle.

Insufficient problem analysis is done to target the objective with the right innovation and the right level of resources. Sony dominated the small copier and transistor radio market from the beginning because they applied their resources to a clearly defined objective, says Drucker. "Hit them where they ain't," Entrepreneurial Judo, requires some degree of genuine innovation. It is as a rule, not good enough to offer the same product or the same service at a lower cost.⁴⁶ DOD has an especially difficult time with the concept of Military Operations Other than War (MOOTW). They hit us where we are not. Traditionally, the services have not thought of themselves as crime fighters, peacekeepers or a humanitarian assistance organization. The drug war is a case in point. Utilizing surface combatants without adequate numbers of helicopters and forward looking infra-red radar (FLIRs) to chase 40' fiberglass boats is not well conceived. Spending \$30M a year using AWACS to sort light aircraft for short intervals has been unproductive and is countered by cellular phone calls. This is also a cultural problem. The result of viewing the problem through traditional lenses and failing to define the problem in sufficient detail to create good innovative requirements leads to the misapplication of resources.

Senior sponsorship (OSD, service secretaries, service chiefs, CINCs and type commanders) of an innovation is essential. "In each instance the tremendous importance of a single "champion" for the project was clearly established, which indicated that factors of inspiration, stimulation and a feeling of enthusiastic commitment are essential ingredients of success."⁴⁷ De Simone's champion or senior sponsors not only bring legitimacy and

resources, but act as a place holder at the trough for support. There is a down side however. It is very difficult to ascend the ladder without help along the way and CINCs have no real funds of their own. Components are in many ways locked into existing programs. An innovation that dovetails into an existing program or doctrine may fare better.

If an innovation does not fit with an organization's current doctrine or it is perceived to compete for the resources or mission of an organization, it will result in some degree of conflict between that organization and the innovation. The degree of conflict is proportional to the uncertainty created in the current doctrine and the organization that lives by that doctrine. Eisenhower and Patton tested and experimented with tanks at Ft. Meade in 1919-1920. "However, the rigid, official view of doctrine in this period was inhospitable to innovation. When Eisenhower and Patton began to write articles based on this experience, Eisenhower was called before the Chief of the Infantry. I was told my ideas were not only wrong but dangerous and henceforth I would keep them to myself. Particularly, I was not to publish anything incompatible with solid infantry doctrine. If I did, I would be hauled before a court-martial. George was given the same Message."⁴⁸

Incremental and evolutionary approaches to innovation are a standard by which the DOD has become accustomed. It is a compromise between the doctrinal stagnation and the pursuit of revolutionary ideas. As Zeev Bonen, Director of the Israeli Armament Authority observed "Because of the organizational rigidities of large complex organizations, the introductions of innovative technologies usually takes place in stages."⁴⁹

These stages are:

1. A new system replacing an older with few changes to organization or doctrine.

2. The new system is improved incorporated with some changes to organization and doctrine.

3. Finally, the organization is and doctrine are aware and of the new capabilities. It is often integrated with other new technologies and may now be employed in accomplishing the mission in a new way.⁵⁰

This process is normal for a bureaucracy seeking to minimize uncertainty, optimize an old innovation. The problem with it Robin Lawton points out is not that you do it, but why and for how long. "Convergent thinking refers to the incremental modifications we make for improvement. Convergent thinking about quality is always product or process focused. In the short term, convergent thinking works well. In the long term, it spells disaster if we don't focus on the results the customer is trying to achieve by using the product. Innovation is outcome-focused and requires divergent thinking."⁵¹

Promotion, training and command are essential to the development and protection of a new innovative means of warfighting. In the late 1800s-early 1900s Tirpitz's influence of promotion policy favored other communities over submariners. "The engagement of the officers of the auxiliary corps is explained by their interest in acquiring the same status as the regular naval; officers, i.e. the officers of the older more established branches. In the German Navy the submarine idea-as well as the various other ideas of investing in light units instead of battle ships-may have stemmed from the same motive promotion."⁵²

Even if innovative warfighting skills are nurtured by promotion and training, there has to be a vision of how we will employ them. An innovation may not be part of the script. Script writing attempts to plan the next engagement and often makes assumptions in

capabilities for both sides that will drive resources and innovation. Everyone in DOD has a conception about how a future conflict will be fought. Innovating against this and other beliefs may be difficult. The portly and steel eyed COL Gray with his three pocket protected airman surveyed the target deep in enemy territory from their air-conditioned van in Tampa. With a nod of his head and a bite from his moon pie the COL initiated the attack. Between feverish sips of RC Cola each man initiated the automated target trackers of their unmanned aerial vehicles. Moments later the battle damage assessment (BDA) was complete and air medals were automatically entered into their service records. After congratulating each other on disabling 95% of the enemy's automated teller machines (ATMs), it was time to select the unmanned aerial vehicles (UAVs) automated recovery feature. This provided some time to have a much-deserved beer and prepare some detail for their ever-shortening war stories.

These scripts also carry with them a variety of sunk costs. Arthur Alexander wrote "Large complex organizations do not spring up overnight, nor are they designed and built in one piece. They evolve gradually in a very complicated process that owes more to historical accident than to rational design. Large investments in equipment, training and the mastery of existing doctrine produce inertia to change. Organizations, once created, have distinct identities because changing the (internal communications) codes or rechanneling the information is costly. ...behavior patterns of the organization itself may persist over long periods because of the investment in routines and techniques that the organization develops to go about its business." ⁵³

The arguments that a tight budget and the 'zero sum game' are somehow responsible for DOD's reluctance to innovate are simply not supported by history, academic thought or the people in the field. Amphibious warfare, Blitzkreig, naval aviation and other innovations were all done under periods of great fiscal constraint. Rosen contends that "Rather than money, talented military personnel, time and information have been the key resources for innovation." ⁵⁴

In the funding debate, cost and value are measured between the aligned, overwhelming known and a subordinate possibility. Frederick Bailey sees it as a debate of the importance of an item or issue by the organization. "The acceptance or rejection of an innovation will be the outcome of the debate about its likely consequences for other valued things. The severity of the debate will depend partly upon the specificity of the code which lists these other valued things and the way they connect with one another." ⁵⁵

An odd twist to funding considerations is that culturally, we still at some level perceive a direct correlation between cost, quality and power. We also make similar judgements that 'bigger', 'faster' and 'more' is better. Modest programs do not get the same visibility as expensive programs and the ability to provide innovative cost avoidance is not the centerpiece of military activities. Savings is a by-product of another objective. Precision guided munitions (PGMs) are a good example. The object was not to drop less bombs. It was to destroy a target more effectively and reduce aircrew exposure to a high threat environment. Savings are expressed in our ability to generate 'bigger' sortie rates and the ability to hit 'more' targets 'faster'. I know of no officers who would want statements in their fitness reports that read 'Dropped fewest bombs in theater', 'Commanded

'the smallest unit' or 'Flew the slowest aircraft in the inventory'. The point is that we have a view of what an innovation and a priority look like and this is often reflected in our funding.

It comes down to a good strategy and properly assigned resources. This alone would create the "slack" needed to fuel some innovation. "The real problem with the Department of Defense isn't fiscal, it's strategic," says Andrew Krepinevich of the Center for Strategic and Budgetary Assessments. "It's not that they don't have enough money; it is how they spend the money they have."⁵⁶

DOD has great difficulty applying business-based approaches to the way we conceive of delivering goods and services. Cote noted that this system (DOD) works to stamp out business dynamics at every opportunity.⁵⁷ Innovation is part of the life cycle for any business endeavor. By pursuing one way of business only provides an opponent a greater opportunity of inflicting damage. Disruptive technologies like the assault by Conner's 3.5" computer drive on Seagate's 5.25" market was devastating. Seagate was locked in too long to the larger drive and missed what was really needed. "Innovation as a total connected process is recognized by some industries, but the industrial and government climate, as a whole, is neither adequately appreciative of nor conducive to innovation in our society" says De Simone.⁵⁸

One of the DOD's problems with releasing its innovative potential is trying to line up current doctrine with a changing world. The best metric for this should be an alignment of plans and innovative strategies to tie the National Security Strategy, National Military Strategy and Theater engagement Plans together. The Cold War is over and the Army is still struggling with what it should look like. The Navy deploys as much as ever. The Air

Force is nurturing a large inventory of strategic weapons. Plugging in many of our weapons systems to the changing missions not only fails to get the job done but sends poor strategy and policy messages around the world.

Human Nature. There is also an individual resistance to change. In some ways this is reinforced in the military. Personnel are transferred every two to three years. They spend six months learning a job, twelve to eighteen months doing the job and six months leaving it. It has to be considered that moving stress, new job stress and job stress all tend to reinforce disdain for uncertainty." Another major impediment "consists in the dislike of change felt by most men, and their resulting hatred of the individual who suggests change or is charged with bringing it about."⁵⁹

Work by March and Simon outlined in a book called Organizations identified the limitations of human decision-makers. Because decision makers are limited in time and capacity to handle multiple problems "(theoretical models) are often inaccurate because they do not take into consideration the limitations of human decision makers. Additionally, external factors such as office politics and others' preferences can affect the decisions made."⁶⁰ Rather than being rational throughout the process, decision-makers will do only what is sufficient or easiest to solve the problem. It is human nature.

Leadership can often get fixated on a belief. In the case of modern technology leadership often believes the 'Silver Bullet' is coming. In this case, technophilia may try to create a system at the expense of the overall force only to find that it has limited application against a new opponent. Strong organizational belief can keep an organization from looking at other real solutions because they believe they already have the answer.

An organizational perspective is one of the most detrimental forces to DOD innovation. It can assume other governments, peoples and organizations see things and interpret solutions the same way we do. This is a costly and unproductive viewpoint. Consider this: One in four people on the planet has ever made a phone call. Fewer still have ever touched a computer. If we approach a problem with a single set of high cost and poorly adapted tools, we are less likely to be able to incorporate allies in the strategy and diminish our chances for success. If we are successful, it will come at a greater cost.

In a changed world, we need to be part of an increasing number of alliances and to share burdens. There are three subsets to organizational perspective that hurt our abilities to innovate. All have been identified by Bracken. The first is the view that all technology used to solve a problem has to be new. We have a retro-technology aversion. "Sidewise technologies are established technologies that develop not by new technical advances, but by application to new problem areas. The key point is that innovation still occurs... In the United States especially there is a tendency to conceive of science and technology only in terms of new advances- and this causes a major blind spot." ⁶¹ Examples include: conversion of the old DC-3 to a turbine version for logistic support of Colombian military in counterdrug operations; addition of air to air radar to Peru's and Colombia's A-37 aircraft to enable air intercepts of illegal aircraft; and using variations of commercially available boats to conduct riverine operations.

Another problem is that the solution to a problem will look like ours. " Low earth dams are not nearly as complicated, are cheaper, and depend on simple versions of an advanced solution, the high dam... Yet low dams are overlooked because of the innate bias

to the advanced technology solution: the high dam with reinforced concrete and deep intake valves. That is what people think a "dam" should look like.⁶² For DOD, the word innovation should be first synonymous with effectiveness and secondly with efficiency. If we cannot approach problem solving with a willingness for options, we will get neither. In Peru, there has been an effort to subsidize a cottage industry that produces riverine vessels for their navy as opposed to the United States providing the now traditional Boston Whaler version.

The most dangerous point is that given our military preeminence, would we see an adversary using established technologies that are good enough to counter us? "The question that should be asked, instead of a Chinese RMA, is how might sidewise technologies change the techno-military balance? A related question is whether or not the United States would even recognize alternative sidewise technologies long developed by the west."⁶³ This blind spot, this bias as to how things should look and work limit DOD's ability to innovate now and possibly in the future. It will affect the focus and direction of innovation.

Many people are analogy retentive. Individuals tend to simplify the decision-making process by relating a past event with a current issue. These are partially valid at best. Linking the wrong event or image to a project can be detrimental to clear consideration of an innovation.

Non commitment to an issue by members of a group is normal. Especially if that commitment may put them in conflict with the positions of their leadership or the majority. The non committed group usually consist of uninformed, uncaring or the politically astute

individuals that wait until it is in their interest to rise in consensus of an idea. " ...the small group of people who make things happen, a little larger group who watch what goes on and an overwhelming majority who have not the slightest idea of what is happening...(There is a further subset of) those who watch everything that is being done and point out what is wrong with it." ⁶⁴ It seems that this latter group is often drawn from the 'status quo seekers' mentioned before. These individuals will not be voluntarily enlisted in an innovative cause. The innovator may be viewed as an added administrative drain on their day.

The innovator's skill level, persistence and personal qualities are the catalyst for change. Galbraith offers the following list of qualities of successful innovators: the need to achieve, the need to take risks, irreverence for the status quo, knowledge of the business, and varied experience, because, for it is the generalist, not the specialist, who creates an idea that differs from the firms current business line. ⁶⁵

Vincent Davis defines the characteristics of the Navy "Innovative Advocate" as "a man in the broad middle ranks (LCDR through CAPT); ...is seldom the inventor, but he usually possesses uniquely advanced technical knowledge pertinent to the innovation that is not generally shared within the Navy; he possesses informational power; the advocate is a passionate zealot; he is enthusiastic, a critic of inefficiency and creates friends and enemies and ...seldom pays any attention whatever to the way in which his crusading efforts may influence his personal career in the Navy or elsewhere." ⁶⁶ The innovator is on a mission and not generally intimidated. The innovative advocate does not do stupid well.

Davis looked at cases that included the development of nuclear propulsion, fleet ballistic missiles and nuclear weapons delivery by carrier aircraft. He took the time to look

at the elements of a successful advocate's political techniques. Within the Navy he must first create a horizontal political alliance. Secondly, he forges a vertical alliance with powerful people in key positions. Seldom does the innovator or his alliance seek or admit to supporters outside the Navy. Disputes are settled within the family. Finally, ideas are not sold as "new" but as better ways to accomplish an established Navy task or mission.⁶⁷

The advocate's opponents on the other hand, form a similar strategy. The counter alliance usually starts horizontally but at a much higher level and then moves vertically down the chain. It lacks the same energy as the innovative alliance but may evolve to the point of initiating coordinated, concrete actions to stop the innovation. The primary argument of a counter alliance is excessive cost. Also the adversaries did not talk in terms of alternate futures but of present naval convention.⁶⁸

Enthusiasm on the part of the innovator is a double-edged sword. On one hand it is essential to salesmanship, the other it is a red flag for the cynically ensconced. Nothing seems to annoy the status quo more than the rock and roll of innovation. Their response is often 'if it looks like fun, its snake oil'.

People tend to ignore information they cannot process. In March and Olsen's book Ambiguity and Choice in Organizations it described a "garbage can model of organizational choice." This is another nemesis of the innovator. In it, the divisions of the organization have the answers to problems. If someone had a similar problem in the past, it was passed to that division for resolution. If there was no answer it was left unfixed. The portrayal is "an organization is a solution looking for problems. In other words, an organization will seek to solve the problems it is most comfortable solving using the particular experience of

its members." 69 This kind of mentality may account for the persistence of bayonet charges after rapid fire weapons tactics were introduced. Like the "garbage can" model, bureaucracies are solutions waiting for questions. As long as it is the right question, somewhere in the organization there will be an answer. An innovation tasks the organization in an unaccustomed fashion and creates uncertainty.

Organizations can base decisions on past successes and past failures. The danger is taking the wrong lesson and applying it to an unknown future. After WW I, the Germans reinvented themselves as Blitzkrieg. The French on the other hand created the Maginot Line.

This limited discussion of three elements, comprised of eight subsets and with more than twenty-five specifically identified traits are components used in many organizational and innovative theories. Most case studies and innovative discussions revolve around much larger events and technologies. There is a real lack of cases detailing smaller innovative attempts and their success or failure within DOD. The ULA V case will explore whether the elements discussed above are present in a smaller innovative event?

In the following case study a six-digit number in parenthesis follows many of the described events. These are links to copies of the actual documents for the case. This case and the conclusions drawn from it are not in all respects complete. As it is with most cases, it was not possible to have all the facts, knowledge and motivations of the actors. There has been a real attempt to discriminate between what is known and what is not. Any supposition is identified as such.

"...the essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result. A case study is therefore an effort to contribute to policy and decision making rather than to science." (Schram 1971) 70.

ULAV Case Study Narrative and Analysis

The idea had not come to him from some oracle. It was not even a concept that was new. It just over time seemed to have the potential for being a better way to do business. LCDR Ray Anderson, USNR, was a Selected Reserve (SELRES) living in Northern California and working at US Naval Facility (NAVFAC) Centerville Beach as the MWR Director. A Naval Aviator by training, he became interested in ultralights (UL) as a way to get back into the air. He used to watch them as he made the monthly, five hour drive to NAS Moffett Field to drill with Anti-Submarine Warfare Operations Center (ASWOC) 1080. Just north of Petaluma was a small strip that was home to a group of UL enthusiasts and he enjoyed the short diversion of watching them.

The activity was counter to his cultural concept of flying. He had a formal flying background. He was a private pilot at eighteen and flew A-4s and A-7Es in the Navy. Anderson was firmly entrenched in the very institutionalized version of the flying technocrat. So he contented himself with watching for many months before actually taking an introductory flying lesson. Further stimulating his desire was the small government salary and two small children on the home front. To fly general aviation aircraft meant

much greater expense and the need to have a willing cadre of friends that wanted to share those expenses. So Anderson began to investigate. He contacted the United States Ultralight Association (USUA) and began reading the trade publication, *Ultralight Flying*. Soon the monthly stops became monthly hops with a USUA Basic Flight Instructor (BFI). He was converted from low drag, high speed and high wing loading to open cockpit and runways of less than two hundred feet. There was enlightenment from a change of perspective.

In the discussion of internal elements, Anderson is Davis's innovative advocate. He is not an inventor. He is a mid-grade officer of fifteen years service and he is not a specialist, but a generalist with some specialized knowledge. Anderson had been associated with surface, subsurface, air, and station management billets during his career. It was in no way the standard pipeline expected of a successful naval officer. He thought of himself as an aviator by specialized training, but he was really a man without a community.

Anderson did his best in all his jobs, not because it would get him promoted. Actually, his promotions caught him by surprise. This is another characteristic Davis points out. While he likes his career it does not dictate all his actions.

He actually enjoyed and appreciated the completely different perspectives each group brought to the Navy as a whole. Anderson really liked what the Navy stood for and had associated himself with it since he could first remember his father in uniform. This fits Davis's concept of identifying with the organization and having been around long enough to have acquired an organization-wide perspective.

He always felt driven to do something more or different in his assignments. It was not always well received by his bosses, but he felt in time they would get over it. Davis noted the innovative advocate's propensity to be zealous and having an aversion to inefficiency.

That was 1988. In 1989 he traveled with his son John to Temecula, California to tour the Quicksilver factory and pick up his first airplane kit (the precedent was actually set in 1974. As an Aviation Officer Candidate, Anderson bought a \$4.00 set of plans for a 1890 Chanute hang glider and with a list of materials that included cardboard, shower curtain rod holders, duct tape, Elmer's glue and bamboo from his Mom's garden he built and flew his first aircraft.). He met Mr. Paul Mather at the plant and took the tour. He was still hearing that "this is not a real airplane" gremlin of conventional wisdom and wanted to put it to bed once and for all. Paul was and still is a professional. The plant was clean and adhered to quality, precision and production standards.

Many internal elements affecting the acceptance of an innovation are characterized by how the organization perceives it. Does it look like the resources we use now? Does it fit the doctrine we work under? Is it the kind of image we want to project and does it help us fight uncertainty? It is the blemished beginnings of the UL industry that needs to be understood. One of the largest obstacles the program had to overcome was old news. Prior to 1982, personalities like Mario Andretti and Bruce Jenner heralded a future of a new era of aviation. It not only put a chicken in every pot and a car in every garage, but made it possible to slide a personal plane in there as well.

Geraldo Rivera's 20/20 exposé¹ of the UL industry in 1982 showed the lack of professionalism in design, training and manufacturing by many companies. It crushed the industry for many years. While most all the horror stories we associate with UL aircraft came from this period, few fail to remember or even thought about the FAA's role in the early tragedies. The FAA did not allow two seat trainers under the governing instructions for ULs (Part 103). It should come as no surprise that most professional (conventionally trained) pilots read UL accident reports as "Darwin Award Winner" reports.

Today, the industry has matured and robust competition has kept prices down. It is actually difficult to make serious money for this relatively expensive recreational endeavor. Designs/materials are more rigorously tested; engine performance dramatically improved and Boris Popov's development of the Ballistic Recovery System (BRS) for the entire airframe have substantially changed the industry. Best of all the FAA has delegated the issuing of waivers for two seat UL trainers to the USUA and Air Sports Connection (ASC).

It is these concerns and new facts that had to be addressed as a starting point for any discussion and briefing. The innovator had to reeducate the target population in an attempt to change perceptions and cultural beliefs.

When LCDR Anderson entered the sport, it had been born in the late seventies, boomed in the early eighties and severely damaged by adverse publicity by 1984. Since that time a slow and steady growth of the industry has continued worldwide. He chose as his first aircraft a Quicksilver Sprint II with a Rotax 503 engine with a drive shaft, wooden propeller, and a BRS 750 chute. He built the aircraft in a clean room he constructed in his next door neighbor's barn. It took one electric outlet, small toolbox and about 110 hours to

complete. The engine break-in was done with the aircraft tied right to the columns of the barn. On Memorial Day weekend 1989, the first test flight was made. After the plane was disassembled (to get it out of the barn), it was carried to an adjacent cow pasture. To remove the ship from the bottle required a small chainsaw modification to the barn door. It was a very good weekend of flying. "Rush" is an inadequate word.

In January 1989, he had transferred his drill site to Medford, Oregon as the XO of Naval Reserve Maintenance Training Facility (NRMTF) Puget Sound Detachment 822. It was an hour closer to home and could lead to a command billet. During this time he contemplated a military application and was not surprised to find that Quicksilver had written a rough plan for such operations (880101). Anderson's entrenched work ethic let him do little for pure pleasure. It occurred to him as he deftly moved from river bar to beach and from hillside and back roads of the remote areas of Northern California that the platform had capabilities. His own military background led him to consider military applications. The bad press over UL safety was never an issue to him. If the military had taught him anything about flying, it was that when a program was institutionalized it came with standards and doctrine that eternally moved to reduce risk. This recognized DOD's internal organizational objective to express programs into standard operating procedures (SOPs). A military UL program would by design be risk managed by an organization. It would not be left to individual carelessness that claimed many early UL fliers' lives.

Now the LCDR spent his weekends doing some flight instruction, barn storming and recreational flying in Humboldt and Siskiyou counties of Northern, California. The low population density and rugged beauty created an environment that was both challenging and

permissive. This was the only two seat aircraft of the five ULs in Northern California, so the local media wrote some newspaper articles on the novelty (890601 and 891015) and even a local television crew took a ride.

As a result of his affiliation with NRMTFPSDET 822, a chance opportunity arose when he brought his unit to Naval Station Mare Island and SBU XI to help complete repairs on a variety of assets the unit had acquired. On 15 January 1991 when checking in with the CO, CDR Doug Hatfield, and his OPSO, LT Parker Dinwiddie, at the end of a very productive day, they began a personal dialogue which led to a discussion of ultralights and a potential to support riverine operations.

The Navy Riverine Units (Special Boat Units, SBUs) no longer had routine access to air assets. In fact, since Vietnam where the HAL-1 Sea Wolves in UH-1s and Black Ponies in OV-10s routinely were at the call and support of riverine units, the units now seldom trained with aircraft. This was contrary to the tactics required to accomplish their mission in the real world. An organic air asset not only allowed the more efficient use of boats, but also was significant in force protection to relay information and provide advance warning. The primary needs to be filled were: SBU escort for surveillance and patrol, forward air controller (FAC) and search and rescue (SAR). The result of the discussion was a letter outlining a testing proposal with the intent to submit a Mission Needs Statement as part of the test (910117). This was a positive demonstration of an internal organizational ability to exploit "slack" and conduct testing necessary for evaluating a proposal.

The tests were conducted from 91 May 20 to 91 June 05 and the subsequent package was forwarded to COMSPECWARCOM in San Diego (910801 and 910606). The tests were demanding. Night flying was done with an older generation of night vision goggles (ANVS-5s). Three separate air search radar sites were flown against. This was a test of opportunity since the Navy had the Fire Control Technician "A" school at Mare Island. The aircraft was operated in average 15-knot winds from unimproved areas of the island. As part of the tests in the riverine training areas around Mare Island, the aircraft worked overhead the standard inventory of riverine assets, which included Patrol Boat Riverine (PBRs), the Mini ATC and Zodiac boats. In addition, a demonstration video was produced to accompany the MNS and proposal. The commanding officers letter and report (910801) detailed proposed missions, tests conducted, specifications and formally submitted a requirement to adopt a UL strategy in lieu of the unavailability and cost of other options.

As a result of UAV performance during Desert Storm, COMNAVSPECWARGRU ONE felt the future lay with this technology for the missions that were proposed in the SBU XI report (920207). "The (UL) vehicle, by its very nature, is slow and vulnerable to small arms fire. In light of alternatives to this intelligence gathering problem, COMNAVSPECWARGRU ONE will not support the requirement for ultralight aircraft." The letter went on to say "...the use of remotely piloted vehicles for special warfare missions is being seriously considered. The RPV allows useful information to be gathered in support of our missions without putting operators at risk." This is only a partially valid point. Contextually, the nature of the UAV technology and the competition it was facing in development made it untouchable for at least a decade. Organizationally, they had already

began to fixate on the newly presented silver bullet solution of the RPV. This was facilitated by an increasing desire for casualty avoidance expected by policy makers. Also, aircraft were not part of the SBU organizational script being read at their headquarters. Special Boat Units have no active duty counterpart units. They are priority reserve units run by active duty, special operations personnel. In Vietnam they were active units and had access to air support. Since that time they were subject to on again off again relationship the Navy has with its riverine forces. The Navy has now given the units to Special Operations Command.

The easiest way to answer the mail for the organization was to side step it with a look toward the future. Any risk to US riverine forces and ability to more effectively complete their missions would be addressed later and by someone else.

Anderson felt they had missed the point. For them it was more rational to send ten men and \$500K worth of boats at 10 knots in harms way without a UL, than risk one man and \$25K in a less vulnerable platform supporting the boats. Betting resources, mission and lives on promising future technology without a genuine expectation of meeting a current requirement is at best risky optimism. The trade off between UAV and the UL at the time was that the UAV was expensive and unattainable as an organic air asset. The UL was a cost effective and available bridge to future alternatives. The parent headquarters probably did not have the time to do the proper problem analysis to evaluate the requirement submitted. This highlights the other internal organizational problem in the processing of a MNS. If your boss will not endorse it, it will go nowhere and there are no avenues for an unbiased second opinion based on solid analysis.

As a final act of closure, LCDR Anderson rebutted COMNAVSPECWARCOM's assessment in a personal letter (930301). "RPVs are expensive, logically demanding and few in numbers. They are best suited to hot war environments. Given the current budget crisis, I believe this will remain true." The assertion that remotely piloted vehicles (RPVs) would be capable and available in adequate numbers to support a daily organic requirement within the next few years was in Anderson's mind fiction. It has been nine years since the original request was drafted and the fiction has proved to be reality. By responding, Anderson felt he had now fulfilled his responsibilities in regards to the original proposal and the effort was now completed.

It was not until 1993 that Anderson submitted an article on the tests to *Ultralight Flying* that was published (930201). In spite of its small size, the aircraft had outstanding handling and performance. With a single occupant and six gallons of fuel, very short takeoffs and landing were possible. It wasn't for the speedy. The 40-knot cruise speed did not make it a long distance cross-country machine. In 15-20 knots of wind, you could hover. It was time for Anderson to go to work.

He wanted to do some community service with the aircraft and decided that if it were affiliated with the Sheriff's Department Search and Rescue (SAR) Unit, each would benefit. He joined the department as a reserve patrolman and completed the required college training. He actively participated on numerous searches as a member of the ground component. The problems of over-the-horizon communications, mobility and limited situational awareness were tactical problems that plagued effective operations.

He contacted the Naval Test Pilot School at Pax River Maryland and asked for some design improvements (930801). He sold his aircraft and built an upgraded airframe with gearbox, variable pitch composite prop, modified wing and airframe and a 100Hp power plant.

The counties had no organic air assets. In Northern California there were only three sources of SAR air. They were the Coast Guard, Highway Patrol and Forestry Department. All had to be forward deployed from out-of-area bases at great expense for fuel support. Response and availability were poor. The active coordinator for the reserve patrolman, Randy Held, was supportive of the idea but was well aware of the political/ legal considerations surrounding its application. While the SAR unit used horses, snow mobiles, quad runners and four wheel drive vehicles in their operations (all with high injury/fatality rates nationally), the UL was an unknown quantity in the minds of some county leadership. The position taken was that no one would ask for Anderson's help, but no one would send him away if he showed up.

The aircraft showed for two SAR events. Helicopters attended both operations. The UL had longer on station time, tremendous economy and was logically easier to support. It prompted a letter that said such operations required the county risk manager's approval. The letter further requested a proposal for a program (930721). All programs run by government require a review by the risk management staff to ascertain the amount of exposure any program creates for the organization. This is necessary in a litigious society. Anderson felt it probably would have gone well, since it originated in the SAR unit and directly supported its normal operations.

This was not to be. In September 1993, the NAVFAC Centerville Beach was closed as part of the base realignment and closure (BRAC) process. Anderson's position as well as everyone else's job at the base would be terminated. LCDR Anderson began accepting extended active duty periods to support his family. In December 1993 he was promoted to CDR and was working on ADSW as the Environmental Protection Specialist for COMNAVAIRRES Santa Clara at NAS Moffett Field.

In late winter 1994, he sat in his office holding five job offers trying to decide which to accept. The phone rang and he heard a voice from the past. CDR Doug Hatfield was now the N3 at COMNAVSPECWARCOM and wanted him to accept some additional duty training (ADT) orders (940407) to work the UL as a Special Operations counterdrug project working at Naval Special Warfare Unit (NSWU) Eight in Panama. He still liked the idea and decided that stateside development was just too hard. The program could directly support expanding riverine operations in the drug producing nations of South America and by virtue of supporting non US forces could avoid the restricted innovative environment in the states. The job offers went in the "round file" and plans for the program began (940418 and 940802). Doug Hatfield was well aware of the internal DOD problems with the UL concept and felt the more permissive environment down range might allow the project to free itself from organizational constraints and be more focused on completing a task.

Doug Hatfield also represents what Rosen and Cote refer to as a senior sponsor. Davis would place him as part of a vertical alliance component of the innovation advocates strategy. Hatfield in a sense had protected Anderson and the idea. Now in a position to bring the issue forward again he acted.

Unfortunately, Doug Hatfield failed to detail the program initiative to the CO of NSWU Eight, CDR Bob Schoultz. As Anderson was busy coordinating the details necessary to pull off the tests (airlift, aircraft and spares), Bob Schoultz and his XO, Rick Bernard, were not being kept in the informational loop. When Schoultz finally got the information on the program and the officer he was to inherit, he was behind and it probably irritated him. He laid out the local course rules for Anderson. He wanted local theater approval first before we could start flying. This was a necessary piece of good strategy to build a vertical and horizontal column of support associated with the innovator. It is also reflective of the hierarchical control that dominates DOD and the more restrictive it gets in proximity to positions of power. In this case, the Army dominates SOUTHCOM. Although all the services are hierarchical, the Army has retained, as Davis points out, a traditional mode of organization that results in a chart where the vertical lines appear longer and stronger than the horizontal. At prominent nodes of power (like the CINC), in a high visibility environment, decision making becomes more careful and centralized. What we usually tell a lieutenant or captain to *go do*, becomes CDR and LtCol *go find out*.

On his first day in Panama, 24 April 1994, CDR Anderson went looking for the Panamanian Ultralight Club. It was located on the north end, west side of runway 36 of the reverted portion of Albrook AFB. The Government of Panama allowed the club to operate there since the reversion of the property precluded use as a general aviation field. There, by great fortune the club president Ismael "Pillo" Champsaur and Mr. Al Chase were lying about the day's flying. The club had four hangars and about a dozen airplanes. There was a

700' perpendicular grass strip to the old 5000' paved runway. It must have been a painful task to have leveled and cleared the area.

Without an airplane, Anderson knew it would be difficult to market the concept up the chain of command. He needed to fly, and more importantly, some help gaining access to a platform for demonstrations. Al and Pillo were the right guys. Pillo was the father of ULs in Panama. With about 2000 hours (a lot for a UL pilot) he was and continues to be a "good stick." Al was a third generation "Zonian" working for the Panama Canal Commission (PCC). If you needed something or wanted something done. AL would probably know how to assist you. This provided Anderson with a local support group for his task.

Much to Anderson's chagrin and contrary to his proposed schedule, this was going to be an administratively intensive effort to get the CINC's approval for the flight-testing. From April 1994 to September 1994 only a few critical issues were forwarded. NSWU Eight established a MSN for the UL (940719). The missions outlined in the MNS included: airborne visual reconnaissance, SAR, limited logistics support, over-the-horizon (OTH) communications/ C2, mapping and environmental surveys. The requirement was directed at supporting participating nations conducting CD riverine operations. A Staff Action Summary Sheet (SASS) for the project was forwarded (940914). There was also a rudimentary briefing of the project created (940615). Unlike the previous MNS, this one made an attempt to deconflict many of the internal issues of DOD by tying the innovation to a host nation requirement or capability. It was sort of a mirror image reverse psychology. Many in DOD saw the technical and financial challenges facing any aviation program run by

the participating nations. This low cost non-technical approach matched reality of some and the biases of others.

Anderson was able to fly Bob Schoultz, Rick Bernard and Bob's father, Admiral Schoultz (ret.). From then on Bob was a believer. In fact, with all the administrative difficulties in moving through the process no one really thought the idea was bad.

The closer to the operator the greater the enthusiasm. The representative of the Office of Federal Disaster Assistance (OFDA) liked the idea that rapid, low cost disaster assessments could be conducted in theater. The Air Force security personnel could use it for perimeter security day or night. Riverine crews could conduct patrols more effectively and efficiently with a three dimensional view of a patrol area. The Army could use it for air to ground communications training and a field intelligence gathering platform. They were not only excited, but appreciated the fact it would allow them to be more successful at their jobs. They willingly offered their time and ideas to expand the program.

On the other hand, the farther from the operator, the concerns seemed centered on where it fit in existing doctrine and to a lesser extent money. The non-operator was not affected daily by the project's requirements. The project was just not part of the "crisis de jour" for policy makers. It can be likened to a mechanic who has the right size set of open-ended wrenches to do the job and he is offered a set of sockets. The operator thinks this is a quantum leap forward and the front office has to be convinced in an entirely different way to make the change. This highlights another problem in DOD innovation. It is top down driven very often and the agenda for the top is not the same as the bottom. In one sense the objectives of a bottom up innovation are competing with the day to day concerns of the

organizational leadership. Mr. John Pennella, who was interviewed for this paper, passed the following history about non-intrusive detection. His counterdrug technology office working with contractors had created a family of devices including chemical sniffers and x-ray units that Customs and Coast Guard forces could use to help them locate contraband. Users were part of the development and testing and liked the idea because it would let them do their jobs more effectively. Leadership for both activities were not convinced and did not want to adopt the new technology. It required a contractor effort working with congressional representation to change their perspective. It has fostered a new industry, technological advances and made it easier to inspect cargo.

This was great exposure to the joint world. There were new dialogues, objectives and rules of engagement. CDR Anderson made the rounds briefing and glad-handing. Some of the high spots included: SBU XXVI (CO, LCDR Frank Lauria), Tactical Assistance Team (TAT) Panama (Major Asher), SOCSOUTH (J3 LtCol Nielson, Major Poucher), Joint Special Operations Command (JSOC) (LtCol John Hoffman), Maritime Operations Center (MOC) (Lt. Ronto), Pacific Range Control (Mr. Stoebarl), Navy Operations Center (NOC) (CDR Owens), US Army South (USARSO) (COL Holzworth), SOUTHCOM (J2, SCJA, J8, J3 (COL Flemming, and LtCol Sonnenberg), 24TH Wing, CINCLANTFLT Detachment South (CLFDS), USSOC (Mr. Jim Elder), NAVSPECWARCOM, JTF Panama and a host of other interested groups and individuals. All the units were stake-holders in CD operations. All had some influence or point of contact that could facilitate the program. At the very least Anderson wanted this relatively small community to have the courtesy and opportunity to hear the concept from the horse's

mouth. CDR Anderson completed the ADT in September 1994 better educated, but with a limited sense of accomplishment. The job he had signed up for, to perform some operation tests with an aircraft, did not materialize. This was a rigorous attempt to create a large well-informed horizontal layer of support internal to DOD locally. The innovator, as an internal component to the innovation process, must be professionally believable. He did not invent the UL. Because he built, flew and maintained them, he was able to see an imaginative way to apply them to a naval problem. These are all characteristics identified by Davis.

During this period General McCaffery left and his deputy assumed his responsibilities. This was because of the political process surrounding the appointment of a CINC and the availability of the candidates to give testimony before Congress and then physically make the move to the new billet. McCaffery was also being chosen for the head of the Office of National Drug Control Policy, ONDCP. It became impossible to get visibility with acting CINC, VADM Perkins. He was now double hatted and constantly moved by larger issues. The Treaty Implementation Process (TIP) began in earnest to return properties to Panama by 2000. Two elements appear here. The first is our internal personnel system that moves people around and may hinder innovation by limiting access to some people and removing individuals that time and training have been invested in. The second is the contextual influences of timing. The Senate had approved the treaty removing U.S. personnel from Panama in 1977 and GEN McCaffery was focused on that and later his next job.

The ownership of riverine forces and eventually the Typhoon Class coastal patrol vessels were high visibility issues in play for the Navy and the SOC. This was a larger

organizational concern for both the Navy and SOC than an unproven innovative platform.

This is contextual timing issue that shifts organizational priorities away from an innovation until it is resolved.

CDR Anderson took a position with the 24TH Wing as a Hazardous Material Specialists and affiliated with the Port Services Unit at Naval Station Panama Canal (NS Rodman) from 94 October to 95 February. Later, in March 1995 he transferred to the Reserve Overseas Support Program holding a billet with SC J5. Captain Art Rowley, CO NS Rodman and dual hatted as CINCLANTFLTDET SOUTH (CLFDS), stood up the Maritime Operations Center (MOC) and wanted to take some Navy CD initiatives in theater. He had endorsed the original program forwarded by NSWU Eight and asked Anderson if he wanted to work it and other issues on Additional Duty Special Work (ADSW) orders at the MOC. Anderson agreed. Captain Rowley through subsequent correspondence began to forward the program (941109, 950113, 950421, 950426 and 950530). CDR Anderson continued to work on the program on two ADSW periods covering 95 July to 96 April assigned to CLFDS. The concept had a new sponsor, the Naval Station vice NAVSPECWARCOM.

CDR Anderson took every opportunity for positive visibility. He would do candy drops at command functions and in the local community, fly in to local air shows and on one occasion, 29 January 1995, flew to assist in the search for a young child. The 214TH MEDIVAC launched 2 Black Hawks to Chame, which was about 40 miles from the field. With radio, GPS and survival kit he participated until ground personnel found the boy's body located in a rock crevasse. He refueled by walking to a local gas station with a five

gallon can. Total out of pocket cost about \$65.00. The helicopters burned \$10K.

Knowing external influences like the media could be both friend and foe, he actively sought to build persistent positive feedback for the platform and to counter the negative media about the ultralight that had been laid down in the 80s.

CDR Anderson still could not run any program for Captain Rowley without some source of funds that could be provided to the Navy for execution. Anderson had discussed with Rowley that the first object was to complete a test and demonstration program so a basis for continued operational testing could be forwarded. He was able to locate potential funding for Captain Rowley through USARSO. The Army was supportive and wanted to release funds they could not execute from their Deputy Chief of Staff for Operations (DCSOPS) aviation counterdrug funding. The SC J8 denied the request, as it was not on the current CD Integrated Priority List (IPL) or unresourced requirement (URR). The J3 Deputy Director for Drugs (DDD) would support the request with a CINC signature (950613, 950621, 950629 and 950630). The J3 was provided a request (950704).

The IPL and URR are part of an external process for building the budget within the PPB&ES. There is limited flexibility in a system designed to provide accountability and audit trails in a peacetime environment. Internally, this is also the pecking order for who gets funded from the trough. Usually the CINC submitted only his top 10 for the CINC IPL and a short list as well for the CD IPL. This made a URR list as sort of an authorization for funding later. It was a promissory purgatory. It really often meant the issue was dead for the majority. It would languish there until the advocates transferred or the value it had disappeared.

Concurrent with this was a chance meeting with Captain Laird Stanton, USNR who was acting in his civilian capacity as representative for the Army Material Command (AMC) Field Assistance for Science and Technology (FAST) office. He was building a simulated drug laboratory along the Las Cruces Trail in Panama. CDR Anderson arranged UL support from a local club for him to conduct aerial photographic documentation of his site in the jungle. Mr. Stanton liked the concept and believed that with a test plan his organization could support some level of funding (950711 and 950711). The test plan was developed and forwarded by 10 July (950704). At this point money was not the issue. Between end-of-year scraps, USARSO CD funds and J3 DDD, there seemed to be the necessary resources to implement the test plan (950721).

Here are examples of a contextual timing element that led to a serendipitous meeting with Mr. Stanton and an internal example of slack resources in funding that exist. The consensus of the individuals interviewed for this research concluded that it was not the lack of resources that inhibited innovation; It was the allocation of those resources. Mr. Stanton had access to an appropriate source of funds. Our budgeting and execution system is so expansive and imperfect that it takes a significant portion of the next fiscal year to reconcile the books. There are the "slack" resources necessary for innovation described by Evangelista. Like Moffett, Mr. Stanton just appeared on the horizon at the right time, a chance event. For the same reason business entities co-locate, the innovation process may attract more innovations and innovators. There is a kind of force multiplier created by the legitimacy, competition and protection afforded by a group.

It is also during this period that the J8 had requested each component submit any CINC Initiative Fund (CIF) requirements. CINCLANTFLTDETSOUTH did so and it included the UL project (950731). The CIF pot was just another source of funding that was available to support testing the platform. It did require another level submission complexity and could take much longer. A CIF request had to proceed through SOUTHCOM, the Joint Staff and the Chairman for final approval. If a project submitted to the CINC was approved, it still had to make it past the gate guards at the Joint Staff where final approval was given. Colonel "Fang" Sonnenberg, J3 DDD, was not averse to the UL proposal. It certainly was low priority in the scheme of things and difficult to get before Admiral Perkins. A brief was prepared for ADM Perkins to resolve the funding issue (950807).

This period found the UL gaining visibility in military community. The *Tropic Times* carried two articles about the ULs. The first was a fly-in by five club aircraft to support the 24TH Wing Earth Day festivities with the 24TH Wing Commander, General "Tex" Brown in the lead aircraft with CDR Anderson (950405 and 950428). A staff reporter who recounted a demonstration flight with CDR Anderson at the local flying club (950512) did the second article. Both articles served to enhance senior visibility on the issue and general awareness. This was a positive external element to employ the media in forwarding the program. The degree of influence was difficult to measure. The Tropic Times was the only English weekly periodical produced in Panama. It was a military newspaper and to some extent influenced by leadership. It was very well read by everyone in the chain of command. There were no negative editorials. It served as a method to

answer old concerns about the UL and talk a little about the project. The best measure of its success was the significant increase in the number of demonstration flights given at the flying club to military members, their families and friends.

The Naval Air Warfare Center had read the MNS submitted in April (950426) and offered to fabricate the sensor packages (950726 and 950810). Their interest was two fold. First, a project that could be done rapidly using their excess capacity and common off-the-shelf (COTS) technology. Second, it was a source of reimbursable work for their command. The original MNS had included as part of the emerging mission to add a variety of sensors and equipment. They included basic cameras, night vision goggles, data link, GPS, video and thermal imagers.

By this time in a series of phone calls, Mr. Stanton's office had in fact found \$28K in unused end of year (EOY) funds that could be channeled into the testing program. It was now mid August and the funds being used had a December requirement for obligation. Memos for fuel (950901), shipping (950901) and even a request for grading services to improve the Frog DZ to handle UL operations (950914) were submitted. Captain Rowley retired in August and was relieved by Captain Linda Long. With funding approved, she formally assigned CDR Anderson responsibility for the program (950925).

The Howard AFB 24TH Contracting Squadron had an MOU to support the Navy's contract writing requirements. They were contacted to write the contract to obligate the funds Mr. Stanton's office had provided. The project required all the paperwork of any services or equipment contract. The contract request was normal but the equipment was not. Numerous documents were exchanged clarifying liability, crew training and liability

issues. It became annoying enough that Captain Long was close to calling them and reminding them they were there to support her. The contracting officer exercised great care in the contract's thoroughness because of its uniqueness (950928, 950926, 950925, 951106, 951031, 951031, 951106, 951127, 951130 and 950929). The conclusion was a sole source lease from the only UL dealership in Panama. The contracting office suffered from an internal element that had difficulty reconciling what a contracted item included. It did not look like what they normally did.

The first ULA V SITREP (950913) outlined some additional work done locally to forward the project. A slide brief was prepared for the Riverine Steering Group (RSG)(950710 and 950710) in English and Spanish. This forum reflected service and cultural rivalries. The SOC, Navy and Marine Corps interests came together and many of the new responsibilities and relationships were still being developed. The briefing given before about 60 officers at the RSG (950814) had only one very vocal opponent, Captain Pat Toohey. From his perspective he may have seen the project as distracting from the organizational problems facing the riverine community. Country CD riverine responsibilities, the executive agency for riverine operations and the ownership of Navy riverine assets were real political issues with permanent effects for doctrine, organization, policy and funding. He may have just thought it was ill-conceived idea. The majority there did not hold his opinion.

CDR Anderson's household goods arrived earlier that year as part of his civilian PCS move and with them was his personal UL. The aircraft allowed him to fly those that were interested in the program on weekends at the local flying club. He sold half interest in

the aircraft to another club member to pay some personal debts. When his partner in the aircraft became a shareholder in the company bidding on the ULAV contract, Anderson sold his remaining interest in the aircraft to avoid any perception of conflict of interest.

Mr. Stanton formally announced the ULAV Project and the program objectives in the AMC/ FAST Quarterly September 1995 (950901). Operations supported by DOD were required to maintain a capability to conduct reconnaissance patrol, interdiction and assault missions in the riverine, coastal and remote inland environments. The UL was the proposed alternative to expensive and unavailable mainstream air platforms. The significance of this is that it changed the focus of support from US forces to use in "DOD supported operations". It was agreed that ULs had a place in the US inventory but the politics of a small aircraft were too large to engage in. A US program for participating nations (PN) served both ends and avoided organizational conflict. This was a decision to avoid the internal cultural and sub-cultural problems associated with the use of a non-standard aircraft in an unconventional role.

There were several cultural and organizational problems with US organic UL assets being attached to Special Boat Units, forward bases, port control activities or military police units just to name a few potential users. In tracking down an Army UL initiative in the early 1980's, it was discovered that Army Special Forces had done some testing and in spite of some limitations were willing to continue working the program. The SOC civilian official who conveyed this information, Mr. Whitehead, noted that the program died because Army air thought it should belong to them and conform to an air standard. The same cultural questions, which included ownership, training requirements, flight physicals

and even flight pay, would come up in discussions. DOD sub cultures are so strong that many of those questions would be initiated from people from non-aviation communities.

Most of the units who wanted the ULs, found themselves with a lack of doctrinal support. The ULA V was going where conventional aircraft could not. It was to be an organic tactical asset. It would not be in conflict with their doctrine, but their doctrine would have to be amended for a third dimension. SBUs, Mobile Inshore Undersea Warfare Units, Inshore Boat Units, Port Control Units, Air Force Security, Marine riverine detachments, DEA and others all would have access to a resource that could improve effectiveness at the unit level.

This was also an example of an organizational perspective problem by using low tech to get the job done. The DOD likes to be a technology trendsetter. The military has an image of how things will look and how they will be done.

Work began to get official SOUTHCOM approval to conduct and support operations. The biggest problem was getting to the ACINC. Extensive travel and official commitments as a result of doing two jobs made the task in the end impossible. After CLFDS letter to the ACINC on the project (950807), a dialogue with the vice J3, Colonel Boras, USMC began. He supported CLFDS's efforts and requested information that could be forwarded to the J3 and CINC. This included information on: the flight test plan (950913), the ULA V Steering Committee (950930 and 951024) and also on operational applications like photographs for the Office of Naval Intelligence (ONI) of suspected drug vessels (951023).

By November 1995 (951117) the administrative agreements between commands had been negotiated. Letters of agreement (LOA) with the 24TH Weather Squadron (951129), JOTB Fort Sherman airfield access (951129), USARSO DCSOPS and Plans (951129) and 24TH Operational Support Squadron (951129 and 951204). With these LOAs the ULs under contract could access the same areas and receive the same services as any military aircraft in Panama. The horizontal relationships Anderson created made all these actions possible. It also points out an internal problem of organizations that the agenda of the leadership is different than operators on a daily basis. Anderson had access to all the people necessary to physically operate the program. They were informed and understood.

December saw the completion of Naval Air Station (NAS) Rodman. CDR Anderson in a 2 yard skip loader and the base Chief Equipment Operator (EOC) manned a grader between rain showers and converted Frog DZ into a 500' grass strip with 100' over runs at each end (Missions). He also used a club aircraft and flew the MIUWGRUTWO CO and XO in the Gamboa area during the "Defense Forces" exercise in Panama (Missions and 951221).

CDR Anderson started advance work on training and planning issues. Chief of Naval Education and Training (CNET) was contacted for basic flight training publications as formats for future work (951102). A basic Spanish aviation list of terms was compiled (951217). He utilized the local flying club to help stage photographs for a formation-flying manual. The first document was done in English (970318) and formatted after a Navy flight training publication. A Spanish draft was also started (970318).

Even as flight operations began on 26 February 1996, there was no official documentation from SOUTHCOM for the program. It was not a requirement for the tests, but was desirable for gaining access to other funds and establishing a level of legitimacy with organizations locally. If we had CINC approval for testing it could later provide an additional avenue to validate the requirements (MNS). A program requirement validated by a CINC and component was more valuable. CDR Anderson asked Captain Rowley on two separate occasions prior to his departure about the issue. He was assured that Admiral Perkins was aware of CINCLANTFLTDET SOUTH (CLFDS's) intent to conduct flight-testing and authorized it. Anderson believed Captain Rowley, but without a piece of paper in the file he was uncomfortable. This may be evidence of internal element of non-commitment, lack of interest or resistance by leadership. From a testing perspective, this issue was too small an issue for a CINC and should have been a coordination issue only.

The ambitions of the original flight test schedule were limited by the reduced funding. The original test plans called for two GT-500 airframes. The revised plan would use a Sprint II and Sport II. They had the same motors, drive trains and instruments. The GT-500 kits had gone through additional FAA certification process and added considerably to unit cost. The enclosed cockpit of the GT-500 would have provided more creature comforts and the slicker airframe would have added 15kts to cruise. It also visually made the regular aircraft pilots more at ease, as it looked more like a conventional airplane. It would have appeared more politically correct. The aviation sub-culture could relate to the closed slick cockpit of the GT-500 and not to the open version that was identically equipped.

Funding limitations impacted not only the airframe type, but the development of some training materials. It was hoped to produce some bilingual samples to use at demonstrations for PNs. Additional funds were to be used to lease some off the shelf sensors to show the expandable capabilities of the platform. The other limit of funding was the ability to demonstrate to a wider audience. Funds could have been allocated for demonstrations at some of the numerous CJCS exercises in the SOUTHCOM AOR.

The configured Sport II and Sprint II airframes were good enough for the modified test plan. It was still 300 hours flight time in 100 days of activity. The contractors turned and inspected the aircraft every afternoon after that day's flight. The airframes were washed and inspected weekly. The mission standard was a pre-dawn launch from the old Albrook AFB. The flight would transit the Isthmus of Panama to Fort Sherman 50 miles North via flight planned helicopter routes (routes 1-4), enter the pattern and land. Upon departing Sherman, CDR Anderson would inspect the Pinas or Sherman training areas prior to returning to Howard AFB for pattern work and then RTB Albrook. The average flight time was 3.0 hours (about 120 statute miles). This was the plan for the first 30-50 percent of the allocated hours. Later as targets of opportunity arose, the daily flight schedule would be modified to support local tasking.

Flight operations were not even underway when the first jobs started to appear. USARSO Deputy Chief of Staff of Engineering (DCSENG) contacted CDR Anderson to assist with a range-mapping project. This was a pretty big deal. The DCINC was "encouraging" USARSO to finish this task as part of the TIP discussions being carried out with the government of Panama. The amount of civilian encroachment and deforestation

needed to be determined and measured against prior aerial surveys. This was a good opportunity to support the USARSO Contractor, save the taxpayers some money and do some real work (960111).

Between 26 February and 2 April 1996 the project had supported the Army Air Assault (960401), Jungle Operations Training Battalion (JOTB) (960318), Naval Station Panama Canal (NSPC) Security (960314), USARSO (960212), NSPC PAO (960404), Smithsonian Tropic Research Institute (STRI) (960401 and 960826) and Army Special Forces (960308). Between the two available aircraft, CDR Anderson had flown 100 hours in 36 days. He had crossed the Isthmus of Panama 60 Times and carried more than 36 passengers. It is estimated that over \$250K of cost avoidance was provided.

It was in early April that Admiral Perkins got the good news. The range mapping was completed (960514) at significant savings. As no good deed goes unpunished, the Admiral was now made aware that it was completed by the project UL. At this he directed the J3 to order Captain Long to stop flying operations. No reason was ever given for the decision. Flying ceased by 3 April. Captain Long was notified and a request for consideration was put in a letter and hand carried to his office outlining the success and the remaining contract liability (960502). Three weeks later there was still no response and CDR Anderson urged Captain Long to try and recover some funds by expediting the termination process (960523). The results of the project were published in the AMC/FAST Quarterly (960901).

The Admiral's reasoning is unknown since he would not or did not discuss the issue with anyone. Even the Vice J3, COL Boras, who was getting regular updates, did not have

an answer. It may be because the Admiral felt the Panamanians would feel we used a second rate means of data acquisition. This is not likely since the project was completed satisfactorily to the specifications established by the Army. Some humorously conjectured that because the UL club started flying at 06:30 every Saturday and Sunday morning over the Admiral's house, it may have given him his one chance at revenge. In any event, this demonstrates the difficulty innovation has in a centralized structure where a project can be subject to actions by leadership without discussion.

By 18 April, CDR Anderson was off active duty and back to managing the waste streams of Howard AFB. But before he left he completed a written project rationale (960317) and submitted it to the Naval War College Review to be considered for publication. The editor felt it was material better suited for the Naval Institute *Proceedings*. Anderson submitted it. The paper was formally accepted for publication. They apparently liked it, but like many others did not know where it fit in. The last word has it stashed with the Ark of the Covenant in a Washington, D.C. area warehouse.

It was over...again. There was little relief for CDR Anderson. He was still cleaning up loose ends. He would reconcile fuel receipts (960723) and verify contractor billing documents (960606) for the Public Works Officer and Contracting Officer. He was confronted with a grossly incomplete final report (960703) that because of events would never be written. Things would show up. He ordered Material Safety Data Sheets (MSDs) (960701 and 960701) for all the materials used in support of the project so environmental concerns would be built into the program. He had load master documents for the C-27, C-141 and C-130 to do deployment-planning (960703).

In May, CDR Anderson returned to active duty once again. This time he was the Navy LNO to the CINC working for COMWESTHEMGRU. With a small staff, he covered all the CJCS exercises, port visits and in short coordinated answering the mail for the Navy in the AOR until SOUTHCOM relocated. The job would last until September 30, 1997.

The damn thing just would not die. In November 1995, he had flown COL Paul Ottinger, MARFOR SOUTH NOELEM Panama. Paul Ottinger had also seen earlier briefs by CDR Anderson and liked the concept. Paul Ottinger's boss was also about to get riverine proponency in the AOR. This was just the kind of no frills engagement tool needed down range. Anderson was reluctant to return to the project, but it gnawed at him. It was like an open wound. Before he said yes, he asked his boss VADM Amerault if it was all right to participate on a not to interfere basis. The answer was yes.

Then there was the issue of Admiral Perkins. He had essentially declared the UL a non-starter. However, COL Ottinger said *I work for the CINC, not Admiral Perkins.* Anderson was not looking forward to any more abuse. He told Ottinger he would submit a package with a staff action summary sheet (SASS) requesting CINC support for development of the concept and funding as appropriate in the future. This way everyone knew the child's father. That legitimacy would open doors and would help secure approaches for funding.

General Clark was now on board as the CINC. The package went up with solid endorsements from BG General Bob Wagner (SOC South), COL Bruce Cucuel (SCJ3 DDD), COL Paul Ottinger (MARFOR SOUTH), Mr. Oscar Vera (USCS), LtCol Jim Diehl

(SCJ5PS) and Captain Bruce Russell (SCJ3VD). There was no opposition and a lot of very good reasons to proceed were presented (960929). It was what campaigning was all about. It was simple, could act as a force multiplier, increased maneuver, provided a means to integrate forces and embodied economy of force. There was everything to gain and the risks were minimal.

Now the project had new sponsorship, the United States Marine Corps. The question now was would it fare any better? COMNAVSPECWARCOM maintained the mission needs statement (MNS) CDR Bob Schoultz had forwarded, but did not have the focus for such an effort. They were tied up with SBU and PC ownership. As the N-3 there said at the time, *we don't want to kill it, but there is just too much on the plate*. It was also not seen as a SEAL function to own and operate aircraft. CDR Doug Hatfield had retired so the momentum was lost. Here are several internal problems. The turnover of CDR Hatfield, no time or resources at COMNAVSPECWARCOM to pursue it and the SEALs did not have a vision of owning and operating aircraft. Hatfield was the senior sponsor necessary to answer questions at the type commanders level where component sponsored requirements can be approved and worked. His loss resulted in a breakup of the vertical alliance. The riverine and PC class ships issues contributed to the lack of opportunity to rebuild the connection. The free time and talent Rosen deems necessary for innovation was not there. Finally, SEALs use transportation. With few exceptions, they do not think of themselves as owning it.

CLFDS took the project because it fit with Capt. Rowley's concepts of operations for Navy riverine in theater and his fledgling Maritime Operations Center (MOC). There

were other forces at work. The decision to move the Navy's riverine assets to the SOC was being negotiated. The MOC was destined for closure along with Rodman Naval Station as the likelihood of a post 2000 US military presence in Panama faded before unsuccessful negotiations with the government of Panama. One NAVSPECWARCOM officer told Anderson that *the hand off of riverine assets meant the Navy had no more interests in those issues*. Later, a senior SOC affiliated naval officer would tell Anderson that *he would not do anything to help forward the Marine Corps' riverine effort*. It was inevitable. The Navy in Panama could not provide a home for the project and the relationship between the Marines and SOC over riverine issues was under development. There are clear internal problems with service interests, timing and human nature that were growing because of the implementation of the treaty. COL Ottinger and BG Wagner (SOCSOUTH) were working with handshakes on riverine issues at this point. The shape and control of riverine warfare was being contested. Both organizations had to relocate. The Marines were going to Miami and SOCSOUTH to Puerto Rico. Housing and schools were family priorities.

The Marine Corps had an expanding riverine mission that argued strongly for the asset finding a legitimate sponsor. The Marines also liked low cost pragmatic solutions to problems. The Marine Corps seemed always to be internally resource scarce and it needed external funding, which could be a problem. At some point in time the Marines would be leaving Panama. But this did not phase COL Ottinger. He really understood the program's objectives and conveyed them to his leadership. Another issue would have to be addressed later. Anderson was not a Marine and culturally it would be necessary for the Marines to replace him once the program was underway.

The program had a new component sponsor in the Marines and soon hopefully CINC support. But to do any testing required funding. The project was out of cycle with the Planning, Programming, Budgeting and Execution System (PPB&ES). It was not on the counterdrug (CD) or CINC Integrated Priority List (IPL). The end of year (EOY) funds were drying up. The program implementation strategy was not difficult. CDR Anderson's experience with the platforms for eight years left him no doubt that the concept would work. The scenarios played over in his head. All he needed to do a good operational test was the \$250K it cost to fund one E-3 AWACS flight. It conformed well to the Security Assistance Program. Most of the work could be contracted (keeping US military participation to a minimum). International Military Education and Training (IMET) funds could be applied. Most importantly it engaged a PN directly in our National Security Objectives. It seemed the difference between success and failure would have a lot to do with timing and luck. The contextual element of timing and luck had already played into several aspects of this innovation.

In retrospect, Anderson thought using the word "Ultralight" in conjunction with the project carried too much baggage. Something like light aircraft would have been preferable. He was told on numerous occasions that the low cost of the project actually detracted from the project. This was an internal problem of analogy that linked early UL performance with the ULAV proposal in a negative way.

The J3, BG George Close, took a demonstration flight and confirmed his belief in the proposed concept. His office had forwarded the concept proposal for the CINC's signature via the DCINC. Visiting LTG Campbell, USAF (970214), followed him in taking a hop. It

was the smallest aircraft to ever park at DV1 HAFB Panama. Anderson humorously remembered asking the general's forgiveness before parking because no one had painted wheel markings on the deck for him. Campbell enjoyed the ride and told the 24TH Wing Commander, BG Mark Schmidt, to support the program.

Oddly enough it appears LTG Campbell had no reference to his adventure mentioned. Only three photos of his visit were found, all were in the aircraft and the local media that covered the story did not mention it. A past perception of a UL pilot was that he was an unnecessary risk taker. This may have been an image that may not have been totally appropriate for the three-star.

When COL Ottinger reported LTG Campbell's ride to MARFORLANT, LT. General Wilhelm, he noted the General's appreciation of the concept. As it turned out, LTG Wilhelm had talked to Campbell about the idea. He felt LTG Campbell would like to hang enough stuff on it to move it to the "F-16 approach". He told Ottinger to "Exert every effort to retain control of the ultralight program." (970212) and keep it a "Kawasaki philosophy". This shows the internal cultural viewpoint of the Marines and the Air Force on the same subject. The Air Force wanted to put a lot of sensors on the platform (an F-16 approach) and the Marines wanted to keep it simple (a Kawasaki motorcycle).

LTG Campbell liked the idea enough to ask the 24TH Wing Commander, BG Mark Schmidt, to participate. Mark Schmidt was ready to provide full time facilities and staff to the effort. BG Schmidt personally had some reservations about the program. It was not that the program was an overwhelming safety issue or that the platform had limited capabilities. It just did not quite seem to fit. It can probably be summed up by the

following event. He called down the stairs to CDR Anderson later at the CINC's farewell function and said "Call me when it gets an afterburner." Anderson replied that some one had already successfully adapted a small turbojet on one airframe.

The critical point came 15 February when the opportunity to fly General Clark surfaced. In preparing for the CINC's demonstration, COL Ottinger put two riverine assault craft (RACs) in a section of the Panama Canal and a simulated ambush party ashore and upstream. The General was late and heavy storms with lightening were intermittently pummeling the area. The Marines in and along the canal were soaked. CDR Anderson was killing time periodically "warming the air" with the demo airplane. COL Ottinger's nine-year-old son, Daniel, was his passenger. When the General arrived, his staff was fearful of weather conditions and it permeated the environment. Even the General looked less than enthusiastic. All would have been lost, if a nine-year-old boy had not popped his head into the crowd and said, "It's great up there." Not to be outdone by a kid, the General and CDR launched. Sited CINC, saved subject. The CINC was now on board and had a firm grasp of the subject.

This CINC's flight was reported to MARFORLANT (970121), Lt. General Wilhelm. He liked Paul Ottinger's flying motor cycle approach for the proposed program. Part of this email dialogue was held with Major General Larry Taylor (MARFORSOUTH) who also flew in the aircraft and supported the effort.

With the help of the new DCINC, VADM Doran, COL Ottinger and CDR Anderson were able to finally brief the CINC 25 March 1997. COL Ottinger discussed the matter very casually with the CINC's in his office for about twenty minutes (and not one

slide was used). The result was a verbal approval to submit a request for CIF from the J8.

The MARFOR SOUTH CIF request forwarded at the end of March (970331 and 970428).

Admiral Doran released it in May (970501).

Nine months had elapsed since the SASS had been drafted. It was not just the CINC that was a very agile target, but the required stops at moving gate guards protracted events. The COL and CDR felt the meeting with the CINC was very anti-climatic given the amount of preparation. Once again the internal centralized environment complicated a simple endeavor.

A verbal approval was not enough for Anderson. The CINC was off to Haiti. Anderson contacted the CINC's staff and insisted on a signed document to answer the mail with the J8 or anyone else. The CINC signed it en route and it was returned by fax.

The ULs seemed to have become more a part of the landscape. Albrook Field became a standard stop on the visitor's circuit. Maj. General Magruder (USARSO) brought visiting flag officers and their staffs to the field for demonstrations. Some of the twenty flag officers flown included the Commandant of the Colombian Marines (Flag Officers), Head of the Colombian Army (970228), Head of the Ecuadorian Army (970321) and Head of the Chilean Air Force (970530). The ULAV Project Contractor was requested to help periodically with aircraft (970310). This is the power a legitimate sponsor brings to a program.

To start gathering interest in the program, CDR Anderson prepared for COL Ottinger a package for every MILGROUP Commander. It included a brief about the program in English (970301) and Spanish (970301). It also included a recommendation for

and a sample for Traditional CINC Activity (TCA) funding to bring in briefers to the embassies to explain the program.

An official memo was sent to the SOUTHCOM Science Advisor, Mr. Robert Williams, who was already aware of the project (970504). The intent was to keep him informed and access his extensive technical and scientific knowledge. There are potential technical applications that could have enhanced mission capability. Airborne "taggers" could monitor and track the ULs. Hyperspectral imaging and mapping technologies could help locate targets and facilitate civil/ military public works projects.

However, Mr. Williams was in the clash of what was technically possible and how to get it on the playing field daily. Years of theater experience and a CINC's perspective had taught him that it was not enough to have a good idea. The whole process of good, applied science was woven into organizational, financial and political fabrics that did not always have compatible interests. He considered the ULA V project concept rational and executable. It would not be one of his priorities and he certainly understood the difficulty that this irregular approach would create for the organization that was considering it. He had similar frustrations trying to create a unique CD air platform for identifying drug producing labs, an air to air radar capability for the A-37 and as a board member for the CINC's Requirements Validation Board (RVB). The realities involved in the pursuit of innovation within DOD from Mr. Williams's position included a congressional interface to move the process. He could help guide a discussion on a particular subject by educating congressional representatives and answering questions of cost and expectations for success.

His CINC perspective requires assets to have the ability to respond flexibly to challenges.

This produces requirements not necessarily in concert with force providers.

Anderson wanted to make this a real Marine Corps program. He discussed with COL Ottinger the need for Marine briefers, pilots and a general cadre to assume the responsibility of organizational design (960628, 970505, 970430 and 970603). The colonel agreed. What both were waiting for was the funding to make it happen.

The CINC's trip to Haiti generated the first "Tasker" for the UL to support operations (970625). The CINC wanted to help Haiti seal her coasts from smugglers and felt the UL could potentially fill the void. Anderson felt the coastal and choke point control mission a prime application for the UL. Nightly sorties in the 'Claw' and the southern beaches could prove very productive with a small investment.

Mr. John Lincoln of SCJ8 coordinated the CIF package. In June he went looking for it in the Joint Staff. The package had been reviewed by all the required Joint Staff offices and was forwarded to the chairman with an approval letter. A member of the JSJ8 told Mr. Lincoln that no "non-concurs" were on the CIF submission and it met the requirements established for a CIF program. The Chairman personally vetoed the program with no reason provided (970609 and 970621). The J8 was directed by SCCS to prepare a "Four Star" note to the Chairman (970613 and 970622) for the CINC's signature. It would request the Chairman to reconsider his position.

Even as the 24TH Wing ULAV project personnel had submitted a project request to the engineering department to build a dedicated remote airstrip on HAFB (970630), the CINC had just returned from a meeting in Washington, D.C. In the first morning "CINC

"Update" after his return, the discussion focused ever increasingly on draw down, closure and the move of SOUTHCOM to Miami. When the CINC spoke he turned to CDR Anderson and said he had a personal meeting with the Chairman on several issues and asked him for reconsideration of his earlier decision concerning the ULA V project. The Chairman *would not support the initiative*. Anderson and a few others must have looked sufficiently puzzled that General Clark continued his recounting of what the Chairman had said. After all, this was a CINC asking his boss for a very small amount of money from a pot that was then underutilized for a program that passed Joint Staff scrutiny.

The CINC continued to explain how he was describing the advantages of the program when the Chairman leaned forward and said *Wes, I am not going to support ultralights*. General Clark then alluded to something else the Chairman said as a reason for his decision. It had to do when the Chairman was a colonel at Ft. Lewis, Washington and he remembered a couple of people being killed in ultralights. The room seemed quieter than normal to Anderson. General Clark concluded by saying that the Chairman was retiring soon and we could try it again later. But, it could not be "we". General Clark had orders and would be leaving for Europe. The chairman had linked the ULA V with old news on ultralights. This analogy was deadly. The Chairman's decision appears to have been made prior to getting the facts.

There were three possible schools on the Chairman's reasoning. First, ultralights created an image problem for the most powerful military on earth. This goes to an internal mirror-imaging problem that sees the problem and solution from a single vantage point. It is also cultural because we do not have an image of a military aviator in this type of vehicle.

Second, the chairman may have feared a high body count in the program based on his negative media exposure to the technology. This is also an internal problem where current facts are superceded by older negative images. It is also an example of an external long-term effect of the media.

Last, he may have seen it as a threat to DOD's UAV program. The ULAV could somehow be conceived as a competing program. Is it possible the Chairman was still worried about the issues that forced the establishment of DARO? Could someone point the finger at him and say you are not forwarding UAVs, you are still promoting manned technology that risks an operator. It may be a stretch, but it was the same kind of argument COMNAVSPECWARGRU ONE had used six years earlier. It must have been visceral for the Chairman to turn down one of his CINCs on an issue costing less than two AWACS flights.

Colonel Ottinger decided to put the issue on the back burner until the Chairman left. Colonel Ottinger was very busy with moving himself, his troops and his base of operations to Miami. His responsibilities in riverine operations were growing without resources. He assigned Major Bruce Brahe as his UL project officer at their new offices in Miami.

CDR Anderson was also changing his focus. Upon completing his active duty in September, he was offered a job with Analytical Systems Engineering Corporation, ASEC, as a contract J5 Planner at the new Joint Inter-Agency Task Force South (JIATF-South). Anderson liked his new job. It was developing CD plans and technologies for the Source Zone. He was paid better and because he was not part of the decision process he could think more freely about the mission and less about the politics. As a contract planner he

was not bound by a strict DOD solution. The JIATF-South had allowed him the freedom to explore other options.

To remain a reservist in good standing he needed to affiliate with another reserve unit. The Overseas Support program was closed and under revision. The Navy had no units left in Panama. He was moved administratively to a Volunteer Training Unit (VTU) on drilling waivers until June of 1998 when with the permission of the JIATF-South Commander, BG Howard DeWolf, he received approval to drill in a non pay status.

In the meantime, Anderson had continued to maintain the programs positive visibility. He demonstrated the asset to members of the TIP office (960522), which later led to a briefing of Ambassador Hughes and his Country Team. He worked with the Counterdrug Technology Development Program Office (CDTDPO) to gather data for a tracking project (970715 and 970801). He conducted the first airborne encrypted SATCOM transmissions from a UL. He assisted a USARSO DCSENG stateside UL contractor conduct continued mapping operations out of HAFB (970807 and 98030). The UNITAS deployment (US, Central and South American naval exercise) was photographed from the UL platform (970901). He participated in CONOPS for the USARSO SASS Lite surveillance program because of its similar program goal (970905). CDR Anderson also contacted the Naval Postgraduate School (NPGS) to consult about making airframe design changes (970914) and a graduate design project for creating a military light aircraft (970914 and 980722). He had even worked over the last three years with the club to amend Panama's UL regulation (980422).

In November 1997, the Peruvian MILGROUP submitted a request for a ULAV brief (971109). There was a Marine Captain McQuary working with in the MILGROUP directly on riverine issues. Bolivia's request came in by message in April (980427). CDR Bob Forwood was in Panama for a routine flight physical and like McQuary had seen COL Ottinger's MILGROUP Commanders package on the UL. He looked up Anderson to check the proposal out while he was there. He took a demonstration ride and appreciated the concept.

From October 1997 to April 1999 Anderson worked on seventeen technology initiatives designed for the CD Source Zone and Engagement Strategies. One of which was the ULAV project as another avenue of funding for the Marine Corps. This was endorsed by JIATF-South (971129). The Counterdrug program was an awkward endeavor. JIATF-East was well established and focused on the Transit Zone had more facilities and resources. It worked in a much more permissive environment with conventional resources. JIATF-South was dealing in a vast and diverse operating area. Each had separate challenges.

CD funding is a separate appropriation. It had a different Integrated Priority List (IPL). The requirements validation and development process was non-existent. Country Teams (CTs) have no master to coordinate funding and requirement strategies. And last but not least the agencies and departments participating in "Joint" CD operations bring intact the parent organizations doctrine and policies. These are multiple internal problems. In the JIATFs are the presence of multiple cultures, objectives, SOPs and budgets. All the

initiatives had to be cleared through an unproven requirements validation process that was time consuming and poorly supported.

The IPL documents and CIF requests were resubmitted (971129, 971126 and 971126). Changes were made ensuring MARFOR SOUTH ownership (980111). In January the project went on the IPL (980212).

With the movement of the project to the IPL, the use of CIF became less likely (980304). So much time had elapsed, that this was no longer an emergent requirement and as a line item on the IPL the project had to compete with the other well-ensconced programs. There was belief by the Marines that Riverine Enhancements would be added to existing programs that would open the door.

CDR Anderson wanted to maintain his current knowledge of the UL industry and asked for no cost travel orders in a leave without pay status. JIATF South approved the request (980326). A trip report was submitted (980428). In itself a seemingly small event. But for JIATF-South to proactively pursue and advocate a technology or an initiative to help shape CD operations was considered by some to be not in the job description. Inadvertently, the UL was dragged into another kind of organizational and policy discussion. This is an internal argument over an operational job description. The question was: 'Did JIATF-South have the right to pursue and advocate innovative technology for the CD mission?' It sounds somewhat remarkable that an organization formed as fusion point for CD missions was not expected to be proactive, but limited to the status quo resources provided by the agencies.

Mr. Alex Mondrick had replaced Mr. Stanton as the SOUTHCOM staff Science Advisor. Few could argue that the system was broken and that external initiatives managed by components held the day. No CINC initiative had been successfully forwarded from SOUTHCOM (980604). With this realization, the job description was changed and both JIATFs began building Mission Needs Statements (MNS) and Statements of Need (SONs) to forward the National Security Strategy.

JIATF-South funded Mr. Anderson and Mr. Williams travel to brief the Bolivians and Peruvians. The briefs were not just for the ULs. It was a frank discussion about the requirements that could be facilitated by the JIATF and other targets of opportunity (980629 and 980714). The country team and DCM received the brief in Peru. The Bolivian brief included the DCM and the Bolivian Joint Staff headed by their J3. The briefs went well and both embassies requested demonstrations.

Anderson found several sources of funds and of the estimated \$40K required, Mr. Mondrick came up with half (980714). Money was not the issue. He notified COL Ottinger (980715). By 17 July the Science Advisor was already trying to transfer funds to JIATF-S J8 (980717). Ms. Lisa Sampson (JIATF-S J8) was aware of the project, but found herself between a rock and hard place when it came to funding (980723). She had the funds and could allocate them, but there was a lack of cohesive sponsorship. Mr. Anderson was a contractor, not an organization and JIATF-South had assigned assets and did not own them. COL Ottinger had a new boss, Major General Hill. He was not dialed into the project. COL Ottinger would have needed time to bring him up to speed. The COL

wanted to see some more enthusiasm from SOUTHCOM. The internal, zero sum game was not a problem. Funds could be found routinely.

On July 10TH Major Brahe emailed and said essentially that as much as COL Ottinger wanted to see the project move, it was now up to SOUTHCOM to step up to the plate and make some supporting moves (980710). The COL was not optimistic that they would. The Marine Corps' attempts at DEP&S funds were all driven to badly needed facilities and boats for the riverine program down range.

Even as COL Vacarro the new Marine Reservist (DEA Agent) assigned as the Vice Director of JIATF-S was trying to arrange a UL briefing (980722), the UL project ceased being an initiative. Anderson realized the effort had all been for the unattainable. It was not because the UL did not work or that money and talent were not available. It was a direction the organization was virtually incapable of turning to. Anderson was still thinking about conducting successful operations and not the primary objectives of relocation. As a result, he may have been part of the problem. SOUTHCOM was trying to maintain the *status quo* while completing the movements of commands out of Panama.

Anderson completed all the SONs and MNSs for JIATF-South (JIATF-South was now destined to be dismantled by May 1999) and forwarded them to JIATF-East (980815, 981007, 981120, 981127, 990105 and 990110) as part of his turnover. The ULAV (Riverine Counterdrug Support Aircraft) SON was among them. It had been approved at SOUTHCOM as were many other innovative approaches from JIATF-East. None of them have proceeded any further.

In May 1999, Mr. Anderson, now Captain (select), was working for GTE in the USARSO DCSINT. He was scheduled to transfer with USARSO to Puerto Rico in August. He had built another aircraft over the last couple of months and flying had once again given him the sense of limitless possibilities he enjoyed.

It appears in the ULAV case that all the primary elements that work against innovation were in fact present and in play throughout the life of the proposed innovation. While external forces were visible they did not dominate. The contextual event of timing and the movement of forces and organizations out of Panama contributed greatly to the difficulties.

The internal forces against the innovation prevailed. Cultural, organizational and human nature subsets all expressed themselves. Organizational perspective seemed significant in that this innovation was by DOD standards a step backwards. It was not a high tech, expensive solution and presenting and selling the concept took time. The perspective problem was had two facets. It expected US forces to look and act a certain way and simultaneously expected our participating nation partners to see the solution our way as well.

Conclusions and Considerations

"We will maintain our on-going process of technological and operational innovation that has put us on the cutting edge of future warfighting capabilities. Our Navy people-well-led, working as a team, and taking pride in our Navy-will be the source of these innovations. The imagination and initiative of individual Sailors have given our navy a rich heritage of innovation. Our people will keep us on a steady course toward continued operational primacy as we enter the 21st century."

Forward ...From the Sea: The Navy Operational Concept, March 1997

"And third, assume that our military as it is presently organized and focused is not sufficiently innovative or adaptive to make the right choices at the right time to achieve transformation. Then what major changes are required in the process by which we think about, and adapt to our rapidly changing environment?"

Vice Admiral Cebrowski's opening remarks at the Strategic Change, Transformation and Military Innovation Conference 9 March 2000

"Forward from the Sea" verbalizes our desire to proactively face the future and a belief that individuals within the Navy will be a source innovative change. However, as stated by Cote, individuals and even small teams do not innovate in DOD. They can invent and forward requirements, but lack the power to create change in a hierarchical organization like DOD.

How do we become the preeminent fighting force of the future? This is the question Admiral Cebrowski puts before us. As Posen has said, we do not lack in the number of theories as to why organizations do not innovate. It is old news in the spectrum of time. Cote says, what we lack is any definitive explanation as to why there are successful innovations.

What follows is not a checklist for the innovator or a policy for leadership, but considerations that have to be made as we negotiate toward an innovative end. Not all the proposals have a direct connection to the ULA V case. Each of us has responsibilities in the process. Dr. Owen Cote would say First, do no harm. With that in mind, we proceed.

Leadership and Organizations. Those who lead and manage organizations can ameliorate conditions not conducive to innovation. Understand that what we often define as innovation is limiting. It is not just another incremental change or revolutionary change. There are a range of definitions for innovation that include organizational, doctrinal, training and material. Each provides varying degrees of opportunity. The submission of every Mission Needs Statement or Statement of Need requires the investigation of non-material solutions. Revolutionary change is usually the result of combining several evolving innovations. Carrier aviation required engines, starters, arresting gear and other aircraft and ship improvements. Blitzkrieg required among other things the combining of tanks, planes and doctrine. In this case, the definition of innovation did not include sidewise technologies that DOD or an alliance partner could employ.

The organization must have as Rosen points out the personnel talented enough to make an innovation happen and the time to work on the problem. The use of external

talent can enhance the odds. Industry does this regularly. GTE, Chrysler and numerous companies have remade themselves with innovative leadership changes. In DOD it is hard to bring an admiral in from an outside agency. But the judicious exploitation of reserve personnel or exchange programs with industry could bring new blood to the organization.

Innovation should feed a capabilities-based strategy conforming to the principles of war and not be platform centric. As an example, a capability to drive nails should include the continuous consideration of the following:

-Someone else might help complete the task. Alliances can reduce uncertainty. We have tremendous difficulty influencing events without incurring large costs. If on the other hand we can invoke other resources a more rapid and economical success can be achieved. In the war against Napoleon, the British contribution of using its naval expeditionary capabilities to bleed French resources in Spain were decisive.

-If a hammer is used it should be appropriate to the level of work. Brads are not best driven by mauls. Sidewise technology and tailored assets may do the job better. It is why we have C-17s and C130's in strategic airlift.

-You may need a nailing device and not a hammer at all. Do not continue to do things the same way unless there are valid reasons for effectiveness and efficiency. Mechanized vehicles replaced the horse for transporting men and supplies.

-You should seek a solution that eliminates the need to drive nails. Engineer the problem away if it is reasonably possible. Consummate sailing skills necessary for gaining position in surface warfare engagements were forever changed by steam propulsion.

People that want to participate in an organization by innovating will tend to migrate away from it if this desire is not satisfied. Know where your talent lies and look to the generalist not the specialist for the ideas. Innovators take their subjects seriously and personally.

Change and the status quo are both dangerous to our mission if either premise is taken too literally. Incremental and evolutionary approaches are necessary to maximize an older innovation. They need to be evaluated based on a return on investment during the product's life cycle and in relation to the opportunities in a risk environment. Always look for a better way to spend your money. Innovative change is necessary to become more effective and efficient at delivering national security. It is not a silver bullet. You can be assured a potential adversary is changing as well. Innovation is outcome-focused and requires divergent thinking.

CINCs are the supported commanders and yet they have little financial power. They possess access to CINC Initiative Funds (CIF) that amount to \$1M for one year if the Chairman likes the idea. In this case, the chairman did not like the ULAV project and the CINC had no financial resources to impact the outcome. While Advanced Concept Technology Demonstration (ACTD) were created to move projects faster and does allow a CINC some leverage, it is not the kind of speed and maneuver required to do the increasing number of missions outlined in Theater Engagement Plans (TEP). A case could probably be made that a CINC is only supported to the level and design of the services. If he needs to drive brads for a couple of years, he will certainly be given a maul for a decade. The CINCs

need control of some funds that provide the services with the incentive to subordinate themselves to smaller, short-term requirements in support of the National Security Strategy.

Some key processes in the high end of innovation include the JROC, the acquisition process and the Planning Programming and Budgeting and Execution System (PPBES). The three processes mentioned above are in whole or in part driven by Acquisition Category I and IA assets. By decentralizing the process and emphasizing broader Category III developments, a different kind of innovation can be attained. In fact, the majority of MNSs and SONs submitted to the SOUTHCOM Requirements Validation Board (RVB) in 1999 were ACAT III (items with a procurement cost of less than \$640M). The ULAV project is a case in point. In our National Security Strategy (NSS) we need a long and short view. The services' view is a long term sustained warfighting capability and the processes above support that. More and more it has become apparent there is a need for short term responsive capabilities to support a CINC's theater interests. Certainly a CINC needs to fight wars, but his strategy needs more tools with nuance and economy of force. The concept of "Strategic Deterrence" which had as its basis a nuclear response had to be changed to "Flexible Response" because alternative force applications had to be available for effective foreign policy. The application of force has to be measured to remain believable. ULAV attempted to do this. The monitoring of the riverine environment by national assets or periodic over flights of maritime patrol assets was not believable as a deterrent.

The need to experiment and possibly fail is essential to innovation. Failure is a critical element of innovation. The objective is to incur failure when the risk environment is

lower. Failure becomes unacceptable when the lessons of failure go unlearned. Anderson once won third place in the state high school physics division. What he remembered most was that he won not because it was a success, but because it was a well-documented failure.

Innovation within DOD may be enhanced if research organizations can be funded to do operational field assessments of promising innovations. This ability to field will stimulate additional concepts and interest. The ULAV project needed to complete proof of concept testing to be able to legitimately evaluate its potential use. It had to be subjected to the controlled questions of a more scientific environment outside the reach of the local chain of command. Without this documented science, it lacked some level of credibility.

DOD may need to partition the innovative process from its normal bureaucracy and operations. A better network of colleges, labs, contractors and research facilities that are supported with bright military officers charged with the task of solving problems might have a better opportunity to innovate. This collaborative segregation is necessary to allow normal operations and processes to continue in an environment of greater certainty. It also allows the formation of and access to more creative environments that support change.

There should be tangible rewards for innovators. Promotion paths, command and financial incentives are all valid means of rewarding innovation and protecting the talent for a new warfighting specialty. An active UAV community in the future may eliminate the cyclic shortages of pilots the services continue to face. If we can give aviators retention pay, we can surely find a way to reward UAV initiatives that may eliminate the future need for that retention pay. The reward for Anderson in the ULAV project would have been the

ability of the organization to successfully impact some CD activities, a chance to make a difference and be recognized for it within the organization.

Challenge personnel to solve problems. If you do not exercise and develop the skills to be innovative, your organization will never be innovative. As part of the Professional Military Education process, the curriculum should include the development of a perspective conducive to innovation.

It should be said that in an innovative organization leaders are innovators too. In hierarchical, top down organizations like the Department of Defense, it is even more imperative that leadership demonstrates this ability because it is less likely to come from below.

Innovators. Rosen has said DOD is not short of the talent necessary to innovate. Some innovators are driven to it and others collide with it. In the past, innovators were seen as colorful "mavericks" defiantly bucking the system in the pursuit of good. A confrontation of David versus Goliath. Real, professional innovators have significant responsibilities. It is not enough to malign a system and pass the blame on as organizational shortcomings. A good innovator is hunting for an opportunity. It requires an assessment of not only the proposal, but also a marketing strategy to achieve implementation and adoption. A clear analysis of the innovative environment can allow the innovator to optimize his chances for success. Even small errors in the innovator's approach to introduce change will be the target of opponents. The contents of the paragraphs below are not the preconditions for a successful innovation nor are they prioritized. The research for this

paper strongly indicates applying them to an integration strategy for advancing an innovation.

The innovation should fill a valid organizational need or requirement? In some cases the need may not be apparent or even known. All innovation, whether it satisfies effectiveness, efficiency or some radical new approach has to have as its intent the satisfaction of the customer's current or future need. Think and analyze the concept. The ULA V project was designed to support operational effectiveness and efficiency by reducing patrol length, shortening target acquisition time and expanding the riverine unit's radius of action and ability to provide presence.

Excess capacity in money and resources at the level of innovative entrance is not essential, but it is important. Local dollars can help limit the scope of your marketing campaign and provide for demonstration and testing. Anderson was able to locate resources and funds for the ULA V project at the local level. He was not always successful in being able to access all of them because of some internal controls and specific leadership positions.

There is a vision or belief by supporters that the proposed innovation has a reasonable chance of meeting expectations. "The dreamer generates conceptual formulation of the idea. The realist carries out the task of implementing the idea in a tangible form. The realist makes the dream viable." ⁷¹ You cannot be just an inventor or dreamer. A new concept has to pass daily reality checks. The ULA V project with a very small amount of funds had run up an impressive set of numbers for safety, availability, maintenance, cost

avoidance and operations. It had demonstrated its capabilities dramatically to anyone who had examined it. Even critics acknowledged it might just work.

The innovation should avoid conflict with current doctrine. Most innovations have as their beginnings a life grafted on to another doctrine. If an innovative idea has a linkage to existing doctrine, time can be bought through conflict reduction. Naval aviation did not start as carrier task forces. As the eyes of the fleet, they worked their way into the dominant surface culture. No good politician or innovator should openly advocate destroying another way of doing business. This only awakens the opposition. ULA V wanted to attach itself to existing riverine doctrine. It was actually seen by Anderson as an interim solution for US forces to employ until UAV were available and for participating nations that did not have access to that level of technology. Davis found that internal innovation in the Navy used this approach many times with success.

There should be a base of internal support developed. All the successful innovations required rallying horizontally a cadre of disciples to move the program, an echo chamber or a ground swell of support. A good innovator will sell his idea horizontally first. This can provide good feed back and prepare the way for a vertical alliance. The ULA V project was briefed as the case study shows to elements of all the service components. This generated potential uses other than what Anderson was focused on. It also introduced him to people and organizations with resources or support he would need.

Timing is critical. A proposal synchronized with the budget cycle that coincides with supporting events and personnel assignments is more likely to succeed. Time is a continuum that people view themselves as part of and shapes their beliefs and perspectives.

Time may be required for development or research. The ULA V project was in the right place at the wrong time. The contextual timing problems over shadowed the project. The CINC and all the activities in Panama had to relocate.

The organization that is capabilities based and not platform centered will be more receptive to an innovation. If an organization is culturally predisposed to engage a problem with a specific platform set, the greater the threat it is to an alternate approach. The ULA V project was intended to augment the dominant surface riverine platform and never intended to replace it. There was no conflict.

The innovation is not directly competing with like programs. Successful outcomes for an innovation can be increased when there are competing programs. An individual program may suffer, but the innovation will survive. This describes two levels of competition. The ULA V project was filling a void and was not in direct competition with other assets. Had there been an active UAV and ULA V project doing support for riverine units, they may have competed over funds and visibility. This competition would have reinforced the requirement and may have helped ensure the survivability of one of the programs.

Utilize the innovation to make current tasks more effective or efficient. An innovation that helps an organization do what it does better is more likely to be successful. Incremental innovations are a good example. The ULA V program would allow an SBU's boat officers to save fuel and maintenance costs. With an airborne escort, the boats would have better force protection through early warning and patrols could avoid unproductive areas.

There is an opportunity for experimentation. If an innovator can demonstrate a capability after testing there is a greater chance of innovative survival. The test program for the ULAV project was under funded. A better product could have been presented with a working prototype that incorporated the lessons learned by experimentation.

The innovator must have credibility and other traits described by Davis. The innovator and his cadre are professionals and they have excellent credentials for the proposed endeavor. Historically, the naval officer ranks of O-4 through O-6 and /or 15 years of active duty are the fertile ground of innovation. The ULAV project officer met this metric and because of his varied background, he had acquired a broader view of the Navy than many of his contemporaries. He also possessed the unique knowledge of the proposed innovation.

There needs to be a senior sponsor for the innovation. Internal or external assistance to innovation requires a "Sea Daddy". As Rosen has stated a legitimate power must be enrolled to protect the program and supporters. It can be industry, contractor, Congressman, media or senior military leadership. It is part of Davis's vertical alliance component. Unlike larger innovations where pay, promotion and command are developed and protected by the senior sponsor, the ULAV project depended on endorsements of the project from the Navy, Marine Corps, WARCOM, SCJ3, SCJ3 DDD, CINC and other agencies. The continuity of the sponsor is also important. Because contextual elements moved the project to different sponsors, it became associated with Anderson and not a growing horizontal or vertical movement. This was another critical factor in the project's failure.

The innovator must be of good health and resolute. The innovator must be persistent and be prepared to be assaulted by those who perceive the innovation as a threat.

The innovator must be a passionate zealot. At no time should an innovator in DOD openly violate hierarchical protocols. However, innovators should liberally bend the rules. The innovator needs to be able to deal with the inevitable personal attacks that come with advancing an innovation. The ULAV project on a few occasions created open conflict. These conflicts were peripheral to the project itself. One occurred when Anderson started working with COMWESTTHEMGRU as the liaison officer to the CINC, he briefed the Admiral and received permission to work the issue for the Marines on a not to interfere basis. The Chief of Staff (COS) had not gotten the word however, and berated Anderson until a flag lieutenant with a good memory reconciled the matter. The COS's concerns were that he wanted a low Navy profile not that he cared one way or another about the project. The project officer kept the ULAV project persistently visible. His persistence evoked statements from a minority ranging from stupid to illegal. Anderson concealed any anger he had for the few who maligned him or the project's objective.

He or she must be able to successfully communicate the idea. Marketing is essential to legitimizing the program. It is the means of co-opting senior support. The ULAV was briefed in numerous forums successfully enough to get it carried to the Chairman of the Joint Chiefs of Staff.

Those who will benefit from the innovation must be identified. An alliance partner comes with all the benefits of a bureaucratic organization. Know what organizations, individuals or systems will be challenged by the innovation? They may be the future

adversaries. If innovation by its nature threatens another identifiable organization, try to affiliate with them or be prepared to counter attack. There were several alliance partners for the ULAV project and no organizational adversaries. These sponsors were controlled by more pressing issues of organizational ownership and relocation than a concern for the innovation.

There is a synergy and dichotomy in the relationship of innovator and organization. Consideration and adoption of any of the above for either party in a strategy to facilitate innovation may make the difference between success and failure. There are no guarantees only opportunities balanced against uncertainties.

" Within grand strategy, military doctrine sets priorities among various forces and prescribes how these forces should be structured and employed to achieve the ends in view." ⁷² When Dr. Posen wrote this, he evaluated doctrine as having three components. One of those factors was the degree of innovation it contained.

The United States has been blessed by a break in a long and resource intensive struggle with the Soviet Union. Our economy is running at an unprecedented level and it appears that it will continue. This new inter-war period, if managed properly, may mitigate the scope of future conflicts by laying a foundation global security. The imperatives of DOD are to focus on long term targets of opportunity that reconstitute possibilities. We need to invest in multiple service futures, redefine capabilities and participate in sending clear, uniform policy messages to the world. All will benefit from an innovative perspective.

Choice is only the currency of the empowered. In its unspeakable character, we are able to let people die and are willing, if necessary, to kill others. Our National Security

Strategy is designed to extend our self-interest beyond our national boundaries and push the unspeakable farther from our threshold. Only a balanced, measured and innovative National Military Strategy that preserves our right of preference will serve our future.

This entire discussion of innovation is linked directly to this larger question. The *sine qua non* is 'Do we have the courage to remake ourselves in the image of future capabilities?' Will the Department of Defense as an organization help describe and attain the future National Security Strategy; will we contribute to the design of a safer world or will we simply wait to be overtaken by events?

There is ample scholarly evidence that there are identifiable factors that influence the innovative process within the DOD. The exact cause and effect relationships of the conjuncture of these elements have not been established.

Anecdote. CDR AL Carpenter USN (Retired) recently contacted Captain Anderson. CDR Carpenter is a Naval Aviator, who spent twenty-three years on active duty. Nearly six and one half of those years were spent as a POW in North Vietnam, after ejecting out his burning A-4E over Haiphong Harbor in November 1966. After retiring, he eventually got into ultralights in 1985, and has now accumulated about 3500 hours in ultralights and experimental aircraft (primarily Drifters) and a modified Air Cam, which is called the VLT Enforcer. He and his partner Benny Rogerson, a Captain and 30 year veteran of the Norfolk, VA Police Dept., did a great deal of research and established many contacts within government and industry over the last 8 years, in pursuit of goals common or similar to Captain Anderson. They have recently decided against continuing those pursuits because of the same institutional problems faced by Anderson. His latest email follows:

Ray,

Well, the Air Cam and the Enforcer are a far cry from ultralights, but you are correct in your supposition. I provided the aviation experience, background and credibility, while my partner is a very politically aware and experienced career law enforcement officer. In the many, many product demonstrations in which we participated, and telephone and written correspondence, etc., our qualifications were never challenged. The Enforcer was enthusiastically received, almost without exception, and follow up reviews were very positive. Flight officers and ground officers loved the aircraft and its capabilities! The hang-ups seemed to be from the administrators, bean counters and politicians. Price was usually not an issue, but certification, insurance, and numbers of these aircraft in use in other

jurisdictions were. Of course, we had all the right answers to these questions, but that has not been sufficient, to date! Even the agency, with which we have a two-year contract, at less than cost, has woefully underutilized the aircraft and myself. I would do things differently, if I were to attempt this project again but, as it is, I am too old and tired and behind on important family involvement to continue. The "fire in the belly" has subsided!

Respectfully,
Al Carpenter
CDR, USN (Ret)
Secretary, USUA

Appendices

JOHN J. PENNELL

*Program Executive
Department of Defense
Counterdrug Technology
Development Program*

John J. Pennella currently serves as the Program Executive for the Department of Defense (DoD) Counterdrug Technology Development Program Office, located at the Naval Surface Warfare Center Dahlgren Division (NSWCDD), Dahlgren, Virginia. where he develops technology and systems to enhance the counterdrug capabilities of the military and, as applicable, the civilian drug law enforcement agencies.

Mr. Pennella joined the staff of NSWCDD in December 1995, when he transitioned DOD's Counterdrug Technology Development from the Defense Advanced Research Projects Agency (DARPA) to NSWCDD, for which he had served as Program Executive since 1992. While at DARPA, he was also responsible for the DARPA Operations Other Than War and Law Enforcement Technology development programs. He served as Chairperson of the Joint Program Steering Group, chartered through a Memorandum of Understanding between the Secretary of Defense and the U.S. Attorney General.

Prior to his DARPA assignment, he held various positions within DoD, including serving from 1990 to 1992 as Systems Director in the Office of the Department of Defense Coordinator for Drug Enforcement Policy and Support.

From 1985-1990 he was the head of the Research and Development.



Department of the Naval Explosive Ordnance Disposal Technology Center

A native of Connecticut, Mr. Pennella graduated with honors from the University of Connecticut in Electrical Engineering. Mr. Pennella also received a Master Science Degree from the University of Connecticut. In addition he earned an Applied Scientist degree in Electrical Engineering from George Washington University.

Mr. Pennella has received numerous awards for his outstanding professional contributions including the Department of Defense Meritorious Service Award and the Navy's Superior Civilian Service Award.

ARP Interview Questions

Mr. John Pennella

16 March 2000

- 1. What do you see are the principal impediments to forwarding innovation in DOD?**

Policy makers lack knowledge and often see innovation as risky. They like status quo.

DOD is full of deeply entrenched rice bowls and subcultures. It works do not change it.

Pilots do not really like UAVs. There are also real resource constraints and competing programs.

- 2. Are the problems internal or external to the DOD? There are both, funding externally and internal politics. There are competitions in a zero sum game. One person is trying to drain the swamp and the other is trying to kill the alligators.**

3. At what level is innovation welcomed in the organization? Innovation is most accepted and appreciated at the user level, the pointy end of the stick. They would participate in development. Never had a problem with the user. Decision makers at the top are less impacted on a daily basis and require There is always a requirements pull at the bottom and technology push in progress at the top. Two different marketing strategies. Leadership does not consider return on investment (ROI). They tend to buy what they have in the past when confronted with an innovative choice.

- 4. Are there criteria or a set of attributes for innovative successes in DOD? An innovation must be fielded quickly, safe (intrinsically), simple, of a smaller size and cheaper the better to be successful. It must have a perceived cost Vs benefit. It solves a headquarters problem. It provides leadership better life cycle alternatives.**

- 5. Are the difficulties in implementing innovation budget driven? Funding is an issue only to some extent. In the area of counterdrugs, we could innovate if we wanted, but**

policy makers are only willing to go so far. It is a matter of priorities supported at certain levels.

6. Are there barriers that affect DOD innovation similar or different to other large organization? *DOD is more conservative. It is less likely to give up something. There is the baggage of sunk costs, scripted solutions and requirements that become too difficult to change. DOD can get stuck on a solution. DOD is reluctant to change the requirement and gets stuck on solutions. DOD develops things too long. There is no profit motive. Innovation is easier to do on the outside.*

7. What architectural changes to DOD would you recommend to alleviate the problem? *We need changes to speed the acquisition process to put a product in the users' hands more quickly. The JROC process puts requirements out of reach. We should utilize the Advanced Concept Technology Demonstrations (ACTD) more aggressively. We need integrated product teams that include innovator, user and developer. This will create cross-fertilization in the process.*

8. What degree of influence is personality in affecting innovation? *Personality drives a lot of innovation. You have to be able to sell the product up and down the chain of command. It can drive the process. The ability to "explain the merits" (marketing and salesmanship) of a program will forward the program.*

9. What external processes contribute to stifling innovation? *The budget process itself inhibits innovation. The "Hill can kill" with the tendency for the Hill to "earmark" funds restrain innovation.*

10. What do you estimate is the cost to our National Security Strategy by not actively pursuing innovation? *We go down a path that does not consider ROI. The cost is that we could be more efficient and effective. The same job accomplished at a lower cost.*

11. Can you recount any specific examples or other recommendations that advance this discussion? *Most innovation is done in the face of conflict. Our problem is we are not at war. We need an enemy to innovate against.*

Interview Summary Notes

Mr. John Pennella
16 March 2000

Lead the pack and widen the gap as much as possible. Force the other guy to bankrupt himself. We have the resources, but are we going commit them to an effort. The leadership may not be willing to expend them.

A MNS once in the system is lost. There is no feed back and the mass of requirements never are analyzed or acted upon.

The Non-intrusive Inspections program required a major paradigm shift on the part of US Customs Service and the US Coast Guard. It was initially divisive and contrary to organizational rice bowls. It is a \$250M, 5year program developed within DOD. It was then demonstrated to the end users and then forced by congressional policy makers on the agencies. It could never have been done within the agencies. They would never have allowed the system to start. It was a matter of will, not technology and has lead to an entire new industry.

There must be follow on fielding funds for innovations. Many individuals advocate technology but do not have the level of commitment. To get real innovation you have to create a major paradigm shift. You do this outside the organization (conflict or competition) or bring in some one who has the power to force the change.

LtCol Thomas P. Ehrhard, USAF

Lieutenant Colonel Thomas

P. Ehrhard is a Minnesota native and a 1980 Air Force Academy distinguished graduate. He is an intercontinental ballistic missile combat crew officer with headquarters and joint duty assignments in the nuclear planning process. While assigned to the Air Force Academy, he served as a cadet squadron Air Officer Commanding and taught for the Department of Political Science. A distinguished graduate of Squadron Officer School and Air Command and Staff College, LtCol Ehrhard also has a Master's Degree in National Security Studies from California State University and attended the Air Force's School of Advanced Airpower Studies, where



he received the degree of Master of Airpower Art and Science. He is currently finishing a Ph.D. in International Relations at the Paul H. Nitze School of Advanced International Studies of the Johns Hopkins University in Washington, D.C. under the direction of Professor Eliot A. Cohen. LtCol Ehrhard serves on the Air Staff in the Pentagon as the Deputy Chief of the Air Force's Strategy, Concepts, and Doctrine Division under the Deputy Chief of Staff for Air and Space Operations.

ARP Interview Questions

LtCol Thomas Ehrhard

13 March 2000

1. What do you see are the principal impediments to forwarding innovation in DOD?

There are a huge number of stupid ideas out there. It becomes a sorting problem.

2. Are the problems internal or external to the DOD? *Our current military superiority and its structure are the principal impediments to innovation.*

3. At what level is innovation welcomed in the organization? *When innovation is external to the organization it is more readily embraced.*

4. Are there criteria or a set of attributes for innovative successes in DOD? *When the innovation fits the organization naturally. Success is more likely when the program has strong sponsors. Innovation is more likely when there is no conflict in function.*

5. Are the difficulties in implementing innovation budget driven? *Budget is not a problem.*

6. Are there barriers that affect DOD innovation similar or different to other large organization? *The military is threat driven not market driven.*

7. What architectural changes to DOD would you recommend to alleviate the problem? *Intra-service and service competitions are necessary.*

8. What degree of influence is personality in affecting innovation? *Personality strongly influences the innovative implementation process.*

9. What external processes contribute to stifling innovation? *Goldwater-Nichols Act and Jointness do not necessarily serve innovation.*

10. What do you estimate is the cost to our National Security Strategy by not actively pursuing innovation? *There is no cost. The US military is the most successfully innovative military organization in the world.*

11. Can you recount any specific examples or other recommendations that advance this discussion? *No others at this time.*

Interview Summary Notes

LtCol Thomas Ehrhard

13 March 2000

There is a cultural and functional measurement for organizational hierarchy. For example, Naval Aviators focus on landing grades at the ship. It is cultural in that it is unique to Naval Aviators. It is arguably functional because it relates to the ability to generate the high sortie rates necessary for combat power. There are functional reasons for cultural behaviors. Functional behaviors can transition to cultural perspectives.

Large organizations have a great deal of inertia. The military is innovative. War-time adaptation is a historical driver for military innovation. Policy implications, future of a technology, and general ramifications need to be considered in a discussion of innovation.

Contextual factors can affect different organizations differently. Organizations cannot affect contextual factors.

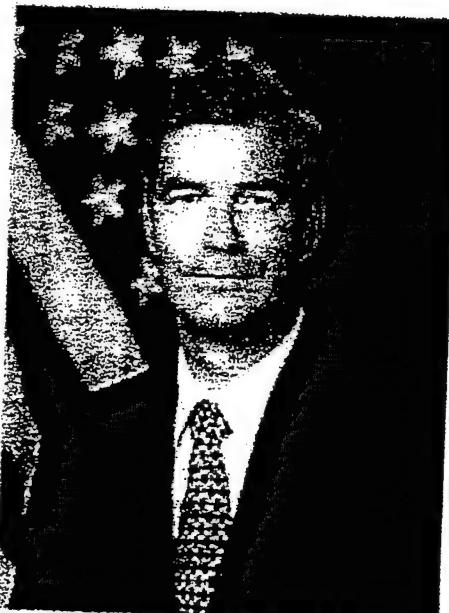
Innovation is defined in the context of an organization that promises greater effectiveness and efficiency. This promise comes with risk that is not the same as with a legacy system. An innovative weapon system is defined as development, adoption and operational use. Is adoption a force multiplier? Does it make you more efficient and effective? When the asset is fielded does the user create an operational innovation? How does the character of the resource change when merged with the organization?

Organizational culture (stove pipes, rice bowls, fighting the last war) will tend to resist change that threatens the status quo. Innovation is driven by necessity. Function, structure and culture define a service. Function is Title 10 and operating environment with roles and missions. Structure is the corporate decision making process affiliated with the service.



ROBERT MITCHELL WILLIAMS
Special Assistant for Technology and Requirements Integration
United States Southern Command

Mr. Williams serves as principal advisor to the Commander in Chief, U.S. Southern Command in all areas of technology and systems. Duties include the identification of operational needs, preparation of and technical requirements for the research and development community, and conduct of technology demonstrations in the unique tropical environment of the region. He chairs the SouthCom (SC) Technical Advisory Group, represents the Command in DoD interagency and international technical communities, prepares an annual SC Technology Initiatives Book and proposes specific actions to advance mission capabilities. Current technical programs in SC include advanced Over-The-Horizon-Radars, Long Endurance Unmanned Air Vehicles, foliage penetrating radars, hyper-spectral imaging sensors, miniaturized air-air radars, unattended ground sensors and a variety of other emerging systems.



Prior to joining SouthCom in 1991, Mr. Williams served as Chief of Advanced Technology for the Defense Advanced Research Projects Agency with oversight of hundreds of DARPA technology programs. In this capacity he worked with numerous technology review groups, various Defense Science Boards, the White House Future of Space Council and Counter-Drug Technology Committees. From 1965 to 1988, he directed the S3/SB joint DoD/NASA National Aero-Space Plane program. From 1980 to 1986, he managed programs including; low observable technology, the X-Wing VTOL aircraft, the no-tail-rotor helicopter program, unmanned air vehicles, new types of aircraft engines, advanced electrical power concepts, fusion and advanced computers. From 1962 to 1980, he conducted research for the Naval Ship Research and Development Center and Naval Air Test Center.

Education includes a BS in Engineering Science and Mechanics from Virginia Tech, graduate studies in fluid mechanics, hypersonics and helicopter engineering at University of Maryland, and doctoral studies in aeroacoustics and X-Wing aircraft design at University of Southampton, U.K. and special studies in radar, computer design and nuclear physics.

Mr. Williams is the recipient of the Defense Distinguished Civilian Service Award, the DoD/NASA National Aero-Space Plane Pioneer Award, the American Helicopter Society Paul Héroux Award, the Royal Aeronautical Society Juan de la Cierva Rotorcraft Award, the Navy League RADM William S. Parsons Award and the Navy's David W. Taylor Award.

Mr. Williams is married to the former Patricia Lynn Powers and has two daughters, Karen and Sarah. He resides in Fairfax, Virginia and is assigned to the SouthCom Washington Field Office in Arlington, Virginia.

ARP Interview Questions

Mr. Robert Williams
20 March 2000

1. What do you see are the principal impediments to forwarding innovation in DOD? *From a CINC's perspective the following apply:*

-Funding: CINCs need substantial funds to leverage Science and Technology (S&T) to address emerging problems.

-S&T: Advice and staffs inadequate. It requires a staff with institutional, theater and S&T knowledge to address issues.

-An increased emphasis on efficiency and effectiveness. Introduce cost effective force multipliers for use by military, inter-agency and participating nations.

-Staffing: A small program staff for over sight and management of programs.

-Leverage: The ability to use the above to influence scope, technical details, operational focus of a service, DARPA and OSD managed programs.

-Institutional capability to continually assess needs Vs emerging capabilities.

2. Are the problems internal or external to the DOD? *The problem is largely internal.*

The CINC needs to be supported for the specific approaches necessary for visibility and success.

3. At what level is innovation welcomed in the organization? *In J2 Collections and J3 force protection innovation is welcomed. When there is a deficiency organizations welcome innovation and contribute, especially at the lower levels.*

4. Are there criteria or a set of attributes for innovative successes in DOD? *There must be a high level of advocacy (OSD/service), Congressional support (to include contractors and lobbies) and an operational and technical element that promises a cost-effective solution to an important problem.*
5. Are the difficulties in implementing innovation budget driven? *It is more a function of reallocation than the infusion of additional funds.*
6. Are there barriers that affect DOD innovation similar or different to other large organization? *No, DOD is similar to other large organizations in its unwillingness to change. It needs to be more responsive and still maintain core competencies.*
7. What architectural changes to DOD would you recommend to alleviate the problem? *Strengthen a CINC's ability to influence the innovative process by providing him with funds and S&T manning.*
8. What degree of influence is personality in affecting innovation? *Personality's influence is immense and drives everything.*
9. What external processes contribute to stifling innovation? *Congress can be a big plus. Lobbies can be bad by shaping perceptions.*
10. What do you estimate is the cost to our National Security Strategy by not actively pursuing innovation? *The long-term affect is that the CINCs are unable to respond to emerging threats in the beginning and the problems become much larger in the future.*
11. Can you recount any specific examples or other recommendations that advance this discussion? *None.*

Interview Summary Notes
Mr. Robert Williams
20 March 2000

This is a perspective based on the needs of the CINCs. A CINC has no real funds and is supported by the assigned services and their imbedded programs. More money is not the issue. Reallocation of some of those funds to a CINC's control will provide the leverage to make the services or agencies supporting him more responsive. It is essential for a CINC to successfully meet his theater responsibilities to be able to be visible and respond appropriately with the right resources. Presence and maneuver are restricted under the present system.

CINC initiative funds (CIF) and Advanced Concept Technology Development (ACTD) are the only limited resources available. CIF is for projects to \$1M for one year and must be approved by the Joint Staff. The process can take many months and has strict guidelines.

ACTDs are sponsored by CINCs in an effort to pool resources and get a program going. OSD makes up less than 10% of the funds and the services provide the balance. This is a two to three year cycle as opposed to a five plus year Advanced Technology Development (ATD) program which is oriented to large scale, complex and specific in cost, schedule and performance.

Operational Field Assessments (OFAs) have been proposed to fill the ACAT III or higher programs CINCs need to meet the changing theater environment. These could be \$5M; two-year programs in the operating environment designed to fulfill real

requirements. They would provide rapid assessment and transition of available technology. This is not a recognized program.

Defense Advanced Research Projects Agency (DARPA) is able to identify and evaluate potential technologies for the DOD. DARPA is limited in funds to field and test working prototypes, which restricts its value to the operator.

The "mind set" for technical development comes from OSD. The principal organizations are the Defense Advisory Committee (DAC), Defense Science Board (DSB), and the service science boards.

The rationale for an improved program stems from the Goldwater-Nichols Act, which gave SOC its own acquisition authority. For a CINC to efficiently and effectively influence events in his theater of operations, he must be able to affect the shape of resources dedicated to it. To better match requirements and capabilities the CINCs need funds for program development. A CINC reserve of \$50M could allow him to pool resources with other CINCs, leverage DARPA programs, acquire limited numbers of assets for evaluation and conduct operational field tests with the help of contractors and FCRC.

An essential element to this concept is the CINC's Science Advisor (SCIAD). A small staff to oversee implementation, coordinate test plans and objectives, establish functional and technical requirements and reviews results for meeting requirements.

Dr. Barry R. Posen

Barry R. Posen is Professor of Political Science at the Massachusetts Institute of Technology (MIT). He has written two books, *Inadvertent Escalation* (Cornell University Press, 1991) and *The Sources of Military Doctrine* (Cornell University Press, 1984).

Other publications include "Nationalism, the Mass Army and Military Power," in *International Security*, Vol. 18, No. 2, Fall 1993; "Competing U.S. Grand Strategies," with Andrew L. Ross, in *Eagle Adrift: American Foreign Policy at the End of the Century*, edited by Robert L. Lieber (NY: Harper Collins, 1996), and



"Military Responses to Refugee Disasters," in *International Security*, Vol. 21, No. 1, Summer 1996.

Dr. Posen's current activities include research on innovation in the U.S. Army, 1970-1980, and research on innovation in the French Army 1918-1940. He is affiliated with the MIT Security Studies Program.

ARP Interview Questions

Dr. Barry Posen
25 April 2000

1. What do you see are the principal impediments to forwarding innovation in DOD?

There are so many. There is no real reason for us to change the way we do business. Peacetime and the way the United States wages war does not provide us with the competition necessary for us to change. We have institutionalized (evolution) not innovation, but permanent regular material improvements where we turn over items in twenty-year cycles with an expectation of real improvement. We have a kind of investment plan in the future. It in itself is a barrier. Are we contributing to the best pathways? The wolf is so far from our door, innovators cannot create the fear/ environment for forwarding change. The principal problem is resource allocation.

2. Are the problems internal or external to the DOD?

Internal. Militaries are weird organizations. You can get a lot of change fast if the leaders at the top think they know where they want to go and do not hedge on getting there. The counter is true. Large, traditional organizations like the military will not move through soft changes. It has the values to change if led. The political impetus model is a strong component of change. End-running can get you equipment but until it is part of the organization's orientation you will not get the conceptual or organizational change.
TRADOC and ACOM's innovation missions will not work because the daily business will consume the energies and time needed to produce innovation. Real jointness has not worked.

3. At what level is innovation welcomed in the organization?

An organization grafted on to new organizations. They are not in a secure position.

There is an organizational technological frontier. The new unit has proven a physical necessity that puts the innovation on the beach. The second move is to get off the beach.

External political forces can get it off the beach. What strategies or structural changes can get the unit off the beach? The innovator must hide the fact he is an insurgent.

4. Are there criteria or a set of attributes for innovative successes in DOD?

Publishing information. You have to have the ability to create new conventional wisdom by controlling an echo chamber. By buying studies from people that have a continuing relationship with you, you can have an idea come from many places. You build consensus and share ownership. Form an alliance and conduct road shows. Co-opted concepts like the mediation process.

5. Are the difficulties in implementing innovation budget driven?

The allocation of resources and not the amount of dollars is the issue. We need to ask the question of maximizing output. What alternatives will give maximum leverage of our resources? The system cannot allocate boldly. Comanche is an albatross. There are existing alternatives to attack helicopters. The marginal utility of additional dollars invested is decreasing. A use of the money for UAV development could produce greater gains.

6. Are there barriers that affect DOD innovation similar or different to other large organization?

I have not worked enough large civilian organizations to comment accurately.

7. What architectural changes to DOD would you recommend to alleviate the problem?

No Comment.

8. What degree of influence is personality in affecting innovation?

The innovator in a non-crisis environment uses a mixture of marketing and alliances to forward efforts. He is not an advertised insurgent.

9. What external processes contribute to stifling innovation?

As a political scientist, the role political leadership plays in innovation can be both positive and negative. It can with resources encourage rapid responses from the military and by no action contribute to DOD's stagnation.

10. What do you estimate is the cost to our National Security Strategy by not actively pursuing innovation?

There is whatever the cost of not using our marginal dollars well and not properly following paths like UAVs and interoperability that ten years ago were already established.

11. Can you recount any specific examples or other recommendations that advance this discussion?

LtCol Douglas McGregor's book Breaking the Phalanx. It talks about TRADOC and efforts to reform the Army.

The Sources of Military Doctrine
Dr. B. R. Posen
April 2000

1. "First, organizations innovate when they fail.... The organization must innovate in a way that achieves the purpose, or it will suffer." "Second, Organizations innovate when there is pressure from without....The organization must innovate or face grievous losses." "Third, organizations innovate because the wish to expand." **The innovative process seems so foreign to military organizations that above it appears fear, punishment and greed are the only motivation.** What portion of military or large organization innovations are done for efficiency, effectiveness and with forethought?

Fear and greed are real drivers. In a permanently competitive environment like the world, motivations have some origin in the need to win. But good theory is caricature. There are those that live for visionary improvement and end state. Who stays in the military when the military is not that important to society? The talented desiring more action.

2. "If statesman change the enemy's identity, the soldiers must change their plans." Should innovation be centered on capabilities (supporting missions/ principles of war) to increase the opportunities of innovative success?

Even saying you have to be capabilities is wrong. The measure of capability against one adversary is different than another. Capabilities are not Omni directional. Capabilities must be amended for by factors. It is a function of time and necessity. A current capability may require an innovation to meet a different adversary. MTW is kind of a generic disease requiring a capability.

3. “Innovations in military doctrine will be rare because the increase operational uncertainty.” “....according to organizational theory, organizations try to control the behavior of their members in order to achieve purposes.... Generally it is not in the interest of most organization’s members to promote or succumb to radical change.” “Military organizations often graft new pieces of technology on to old doctrine.” **Does this attempt by an organization to reduce risk from external forces create and perpetuate an environment prone to “stagnation”?**

It does. It is what an organization is designed for. It holds a problem in time and space so humans can work on it.

Interview Summary Notes
Dr. Barry Posen
25 April 2000

We are in a funny situation where potential competitors are not very close. We also play a game that has established a process at least technologically that replaces our weapons at intervals. It is not innovation. It may be leading us to invest in the wrong platforms and invest dollars at the margin less profitably. In the wake of this effort a little money drops off the table for integration and a little money for a better for a pod or a few dollars for better weapon.

There is a bow wave of technological improvement that we lead. It is easy to convince yourself that you are investing and you have a plan. Maybe that is a good as plan as any. This is not what we did from 1950-1975. The attempt to truly leverage technology is only a quarter century old. What has worked and what you are doing are barriers to this other kind of innovation, which is the nexus of organizations, concepts and tactical doctrine and larger synergies.

Innovators know the need for an adversary to forward their agendas. China threat, India threat or the will of the wisp, a WMD scenario by a non-state actor can create an environment to move an innovation.

The barriers exist for the most interesting kinds of innovation, organizational /conceptual level. Barriers to technological innovation are not there. Money is an allocation issue. We need to examine which alternative to a problem optimizes the output (time over target, dead targets, etc.) of a system. The result would reveal a multitude of

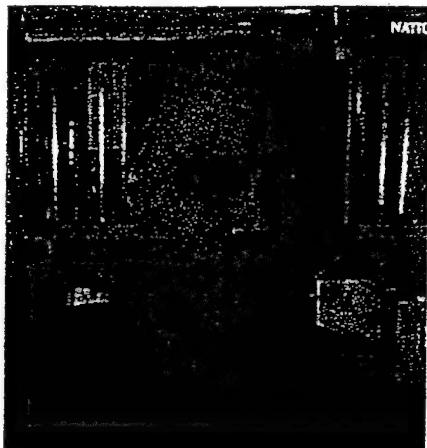
options. Betting on accuracy, miniaturization and connectivity twenty years ago may have seemed a risk. But by 1990 what were we really waiting for?

The political impetus model can move the military leadership to change. Military leadership can bring the organization along. You are only going to get these magic moments of political intervention every so often. If you are trying to do better the rest of the time you have to assume DOD has a problem. DOD is adept at working existing technologies. Thinking out of the box or bringing technologies together is difficult.

Creativity requires the attention of talent that is not distracted. Successful innovators are insurgents with marketing and alliance strategies in a peacetime model.

Dr. Owen R. Cote JR.

Owen R. Cote JR. is Associate Director or the Massachusetts Institute of Technology (MIT) Security Studies Program Study Program. From 1993 to 1997, he was Assistant Director at the International Security Program at Harvard University's Belfer Center for Science and International Affairs. He is also co-editor of the journal *International Security*. He received his Ph.D. in Political Science in 1996 from MIT, where he specialized in U.S. defense policy and international security affairs. His dissertation, which he is now revising for publication, analyzed the sources of innovation in military doctrine, using cases that compared U.S. Navy responses to different Cold War nuclear vulnerability crises. He is also working on a Navy- sponsored book project that will analyze and seek to explain the success of the Navy's Cold War ASW effort.



In the past, he has written on naval and nuclear doctrine and force structure issues and was a researcher and author in a series and Collaborative book projects on nuclear weapons in the former Soviet Union, including *Soviet Nuclear Fission, Cooperative Denuclearization and Avoiding Nuclear Anarchy*. Generally, his research and writing concentrates on the politics of innovation in U.S. military doctrine in the new, post Cold War security environment. He graduated from Harvard College in 1982 and before returning to graduate school at MIT worked for three years at the Hudson Institute and the Center for Naval Analysis.

ARP Interview Questions

Dr. Owen Cote

25 April 2000

1. What do you see are the principal impediments to forwarding innovation in DOD?

A clear threat. An unwillingness to allow a decentralized approach that promotes competition amongst the services.

2. Are the problems internal or external to the DOD?

The threat is external and the competition component is external.

3. At what level is innovation welcomed in the organization?

Many would say that at no level is innovation welcomed. All this has to be viewed at what we are comparing. Many of us compare our military to other business organizations like SYSCO. We should be measuring our military against other militaries and we look much better. We are receptive but there are limits. Innovations that are accepted are evolutionary and we do that well.

4. Are there criteria or a set of attributes for innovative successes in DOD?

You have to be an entrepreneur and find ways of going around the chain of command without going out of bounds. Insurgencies do not break rules but bend them liberally. When an innovator is given a choice, it should not be professional suicide to bend the rules.

5. Are the difficulties in implementing innovation budget driven?

Money is not an issue. It is an independent variable. Some of the best innovation has been in times of lean funding.

6. Are there barriers that affect DOD innovation similar or different to other large organization?

There are all the same barriers and a few additional. The additional ones are: No feedback (leadership guidance) and the line of work (the military risk is measured in life and death).

7. What architectural changes to DOD would you recommend to alleviate the problem?

Lots of organizations competing over a generally defined problem. Let them figure it out. Leadership can make the choices. In peacetime leadership tends to ignore the military.

8. What degree of influence is personality in affecting innovation?

From the bottom up it has a huge effect. The personality has an opportunity to exercise skill in an insurgency. From the top down personality has a lesser affect because leaders' decisions are driven and bracketed by other forces.

9. What external processes contribute to stifling innovation?

Too much centralized jointness (JROC).

10. What do you estimate is the cost to our National Security Strategy by not actively pursuing innovation?

The cost is that we will become increasingly less effective at doing things. We will pay too much for the things we have to do. The increasing additional cost of keeping an aircraft from being shot down may not lead us to question why we do not want it shot down (loss of American lives) and the alternatives (unmanned aircraft).

11. Can you recount any specific examples or other recommendations that advance this discussion?

My approach is to amass examples. Try to look at your experience and then find something in another service and see if there are similarities. The comparative approach is the best.

Precision Strike from the Sea

Dr. Owen Cote

25 April 2000

1. “**Warfare Area Advocacy.** The Navy needs powerful advocates in its individual mission areas.” **How will they develop and succeed against platform oriented dominance?**

The people in charge of that problem now are not the ones who will be in charge of the problem in the future. Planners will select the working platform. This puts a platform as the mission advocate.

2. “The tendency when budgets are low for the Navy’s semi-independent platform communities to ... go where the money is.” **Is cultural survival stronger than mission?**

When the budget is low there is a presumption about the environment. The organization will try to survive. It has good and bad consequences. The cultural perspective is powerful. To walk away from a mission is not riddled with guilt for the services because their job is to maintain your capabilities.

3. “...Navy faces a crisis of relevance.” **Is a “crisis” of this nature sufficient for change?**

You can make the argument that the Navy has more to do than it has resources. You can not make that argument about the other services. Let's break the paradigm about the three-way split of funds and put it where the real need is.

4. "...(asymmetric) threats are often relatively easy to ignore in peacetime, but in wartime, they turn out to demand a massive, integrated all arms response." **Is it the crisis Vs status quo or a funding Vs organizational structure that differentiate the peacetime from the conflict environment?**

The example is the SCUD. The problem was not for the tactical commander. It was a political problem to keep Israel out of the conflict. It became the commander's problem that he was not capable of countering. He wasted a lot of resources. A real danger in the future is the political necessities created by asymmetric threats that are thrust upon the military.

Interview Summary Notes

Dr. Owen Cote

25 April 2000

Innovative success varies from service to service. As Posen has said, we do not lack in the number of theories as to why organizations do not innovate. It is old news in the spectrum of time. Military organizations could only be conservative. We would not want military leaders prone to changing their minds half way through a battle. What we lack is any definitive explanation as why are there successful innovations. There are three views:

Dr Posen argues that state pressures as threats rise drives innovation. States act as rational actors. Necessity is the mother of invention and civilians are the midwives. The leadership will push the military into providing the service. When threats are high and leadership is scared, they will audit military doctrine and provides the military direction. He is a realist. States are forced to be rational by circumstances.

Dr. Rosen reinterprets Posen and counters it. He pursues peacetime innovations stemming from long term internal insurgencies. Innovation is something that bubbles up inside an organization. Professional ambition of groups or individuals within groups within a larger organization that has a doctrine that takes that group to another place. Naval Aviation in the inter-war period is his best argument. There is serendipity involved. States are not necessarily rational and are subdivided into groups with their own agendas and their interaction creates a different, unpredictable environment.

I believe Rosen and Posen's arguments are valuable. Neither explanation captures the new complex military that has competitive doctrines horizontally and vertically. There

was no way to wall off the services from one another. This uncertainty created opportunities to compete for position. The 50's missile program is a good example.

Since then the boundaries have been agreed upon and the incentive to innovate aggressively has diminished. It is collusion vs. competition. This system works to stamp out business dynamics at every opportunity. Individuals cannot innovate. Groups can with senior leadership support. I look at the constituent parts of the organization. Those that manage peoples' lives (training, promotion) and almost separate subcultures like naval air. A bunch of these professional, functional groups exist and they organize. Innovation changes this. It is creative destruction. The causes of innovation break the political boundaries of these types of arrangements. It is done by one of three basic avenues: It can be an internal insurgency, that is time consuming and generational. It will occur in a peacetime environment. It is not a threat-based innovation. Another form innovation takes is threat based where the politicians (powerful people) look around and realize the military is behind. It is based on a reaction of fear in a changed environment. It is rational, but it is still decisions made under fear. It takes less time, but it is not a cause of innovation you want to embrace.

The last is the insecurity between services. It is expensive to have the services competing. This process does promote more effective innovations in a more rational environment. Efficiency occurs at varying degrees.

JROC was a nice experiment. But it does not work. CINCs have a local view of requirements. If you could find a way to get them money to solve their local problems it would be fantastic. But it does not address larger capabilities requirements. Both need to be addressed. The more complex the system the more points of entry for an idea.

I like to exploit the differences in perspective. It is not efficient but it is a source innovation. Know that if you want a capability and you have only general rules about how it is to be accomplished. It will be very messy but very innovative and timely. The conflict between NRO and NSA created great innovation. But between then and now the NRO has become a different organization. It will have to be broken to achieve the same level of innovative successes enjoyed in the past.

Dr. Stephen Peter Rosen

Stephen Peter Rosen is the Beton Michael Kaneb Professor of National Security and Military Affairs at Harvard University and the Director of the Olin Institute for Strategic Studies, also at Harvard University.

He was the civilian assistant to the Director, Net Assessment in the Office of the Secretary of Defense; the Director of Political-Military Affairs on the staff of the National Security Council; and a professor in the Strategy Department at the Naval War College.

He was a consultant to the President's Commission on Integrated Long Term Strategy, and to the Gulf War Air Power Survey sponsored by the Secretary of the Air Force. He was the leader of study groups at the OSD Summer Studies at Newport, Rhode Island for 1985, 1986, 1990, 1992, and 1995.

He has published articles on ballistic missile defense, the American theory of limited war, the strategic implications of the AIDS epidemic, and strategies for promoting innovation in the American military in

International



Security, The Washington Quarterly, Foreign Policy, The Journal of Strategic Studies, Joint Forces Quarterly, and Diplomatic History.

He is the author of "Winning the Next War: Innovation and the Modern Military", which won the 1992 Furniss Prize for best first book on national security affairs awarded by the Mershon Center at Ohio State University, and of "Societies and Military Power: India and its Armies."

Dr. Rosen is currently working on a project on strategy and the biology of cognition.

ARP Interview Questions

Dr. Stephen Rosen

25 April 2000

1. What do you see are the principal impediments to forwarding innovation in DOD?

Talent is consumed by high operational tempo. There is no time or incentive to take the time for experiments and to work with doctrine. You want to free credible warfighters to use real world assets in shaping the next innovation over a period of time. Innovations take time. You have to change the way people work. The people at the top loose power. Protect and nurture those at the bottom. Some senior leadership has to protect and promote the young people coming. What are the promotion and retirement policies? In the Cold War, policies in many ways retained old leadership and eliminated the potential new thinkers. The zero defect mentality is contrary to innovation where failure is part of learning. There are low levels of foreign competition. There is a low level of internal competition unlike the 1950s intra-service missile development that produced rapid results. Joint concepts try to eliminate competition by assigning roles and missions and eliminating duplication. There is no motivation to change.

2. Are the problems internal or external to the DOD?

The internal threats are the greatest. We have had periods of peace before and did well on innovation. We do not do this as part of our organization. Jointness tries to create efficiencies not innovations. We are used to the idea of paying a lot of attention to technology development but we need to spend more time in personnel development.

3. At what level is innovation welcomed in the organization?

At the tactical level. As long as it compliments what I do now there will be no real problems. If it tries to change the way we fight wars there will be a problem in implementation. Incremental changes work best.

4. Are there criteria or a set of attributes for innovative successes in DOD?

You need incentives and training for the people you have. This includes promotion and protection. You have to have some one in a leadership position who recognizes that the world environment has changed.

5. Are the difficulties in implementing innovation budget driven?

We have enough money. What we need is talent. We need people to evaluate and structure the work that is done. All the money in the world cannot solve having the right people. If you do not have the right people you are in trouble.

6. Are there barriers that affect DOD innovation similar or different to other large organization?

Both. Big business is getting feedback every day from the market place. If they are paying attention they get information. There is no lateral entry into the military. You have to rise up from the bottom, which means by the time you get to the top you have been doing something for thirty years and know what the answer is.

7. What architectural changes to DOD would you recommend to alleviate the problem?

Reduce the cult of "jointness". Endorse multiple, competing functional task forces. Give the requirement to all the services. The problem of giving it to the Joint Staff is you only get one answer. It becomes a validation of what we are doing. Expanding the

National Training Centers to do large scale experiments. Most military people have little or no training and do experiments and coordinating data.

8. What degree of influence is personality in affecting innovation?

A lot at the senior level. Mavericks tend to make people angry. He has to be credible to his service and has political skills.

9. What external processes contribute to stifling innovation?

High operational tempo and no external threat. It is the military's game to win or loose. The R&D process is not set up to develop technology rapidly.

10. What do you estimate is the cost to our National Security Strategy by not actively pursuing innovation?

A catastrophic failure in engaging the PRC. It is vague. I see it this way. The U.S. is in a really good position and we should keep it. Which means we have to be adaptive to the changing conditions and not just plugging straight ahead. If we blow it, future generations will look at us and wonder how we lost it (our superiority) just because we were uncomfortable in reorienting to world politics and world military situation. U.S. global military preeminence I think is a very good thing.

11. Can you recount any specific examples or other recommendations that advance this discussion?

None

Winning the Next War

Dr. S. P. Rosen

25 April 2000

1. “The general lesson for students or advocates of innovation may well be that it was wrong to focus on budgets when trying to understand or promote innovation.” **Does that mean it is not necessarily a zero sum game but a distribution problem?**

It is an allocation problem, but more importantly of talent. In any successful organization talent is required.

2. “Civilian political leaders, however do not appear to have had a major role in deciding which new capabilities to develop in peacetime or in war...” **Do you believe this will remain true with the reduction of federal funded research centers, more outsourcing, direct contractor support and a continued shift of the economy away from the industrial base?**

It is not that they are at an arm's length, because they do try to promote innovation. But when you are talking about the major innovations in warfighting, it is the professional military officer's business. Inherently, civilians have a difficulty getting the military to change because they are not the ones who will fight the war. The military has the credibility. The civilians under some circumstances foster and protect military innovation but generally it is left to the military professional.

3. "The inability of social science to explain innovation has not gone unnoticed by experts in the field of bureaucratic behavior. No good explanation of bureaucratic innovation exists." **Could it be that this is a function of intense individual creativity loose in varying degrees of receptive bureaucratic environments?**

Social science is based upon laws. Innovation is not always predictable and may result from some happy coincidence of things you could not predict or engineer. It comes under having the right person at the right place at the right time.

4. "Analysis of military organizations discussed in the previous chapters suggests that innovation occurred when senior military officers were convinced that structural changes in the security environment had created the need." **What is the ratio of senior leadership to innovative senior leadership?**

We have not seen another Moffett. There are some people who are very smart and done some things, but no one has thought the problems through.

Interview Summary Notes
Dr. Stephen Rosen
25 April 2000

A catastrophic defeat in war can lead to innovation, but there are lots of examples of countries that loose wars big time and do not. Something else is taking place.

Our current operations tempo takes the time and talent away from the innovative process, which requires experimentation, integration and changing the organization. This necessitates credible people in the military as an essential part of the process. Instead of relaxing at the end of the Cold War we should be quite busy. It takes a lot of time and requires people to give up. The ageless aspect of innovation in an organization requires the people at the top to loose their power.

You need to train and experience the young people (the more malleable and flexible) and inculcate them with this perspective on the new innovation. You must protect them and keep them from being side tracked in their careers. You need to promote different people in the future than you do now and change the promotion, retirement and personnel systems to achieve that end.

At the end of the Cold War we riffed many of the wrong people. The emphasis was on saving senior leadership instead of clearing old brush out to make room for a new generation of officers.

Innovation requires mistakes and a "zero defects" mentality does not support innovation.

Competition drives innovation. You can hedge your bets by having multiple solutions to a problem. Jointness seeks to eliminate service competition.

End Notes

1. Gifford Pinchot, Intrapreneuring. (New York: Harper & Row 1985), IX.
2. Gifford Pinchot, Intrapreneuring. (New York: Harper & Row 1985), IX.
3. Carlo M. Cipolla, Guns, Sails and Empires: Technological Innovation and the Early Phases of European Expansion, 1400-1700. (New York, Pantheon Books 1966), 132.
4. Carlo M. Cipolla, Guns, Sails and Empires: Technological Innovation and the Early Phases of European Expansion, 1400-1700. (New York, Pantheon Books 1966), 147.
5. James D. Lang, Creativity and Innovation in Defense Technology and Strategy. (Washington, D.C. Industrial College of the Armed Forces, National Defense University 1983), 45.
6. Jay Galbraith, Organizational Design. (Menlo Park, CA: Addison-Wesley Publishing Co. 1977), 36.
7. Jay Galbraith, Organizational Design. (Menlo Park, CA: Addison-Wesley Publishing Co. 1977), 55.
8. Barry R. Posen, The Sources of Military Doctrine. (London: Cornell University Press Ltd., 1984), 59.
9. Barry R. Posen, The Sources of Military Doctrine. (London: Cornell University Press Ltd., 1984), 79.
10. Barry R. Posen, The Sources of Military Doctrine. (London: Cornell University Press Ltd., 1984), 224.
11. Stephen P. Rosen, Winning the Next War. (Ithaca: Cornell University Press, 1991), 21.
12. Stephen P. Rosen, Winning the Next War. (Ithaca: Cornell University Press, 1991), 109.

13. Owen R. Cote, Associate Director of the MIT Security Studies Program, Interview by author, 25 April 2000. MIT, Cambridge, MA. Tape recording.
14. Robert K. Yin, Organizational Innovation : A Psychologist's View. (Santa Monica, Calif.: Rand Corporation, 1978), 14.
15. Hayes, Brad C. and others. The Politics of Naval Innovation. (Newport, RI: U.S. Naval War College. Center for Naval Warfare Studies. Strategic Research Department, 1994) 10-11.
16. Berend Derk Bruins, U.S. Naval Bombardment Missiles, 1940-1958 : A study of the Weapons Innovation Process. (Ann Harbor: UMI 1981), 61-62.
17. Jeffery A. Isaacson, and others, Predicting Military Innovation. (Santa Monica: Rand, 1999), 9.
18. Jeffery A. Isaacson, and others, Predicting Military Innovation. (Santa Monica: Rand, 1999), 11-20.
19. Jeffery A. Isaacson, and others, Predicting Military Innovation. (Santa Monica: Rand, 1999), 52.
20. Emily O. Goldman, "The U.S. Military in Uncertainty Times: Organizations, Ambiguity and Strategic Adjustment", Journal of Strategic Studies, June 1997, 42.
21. Stephen W. Hill, Weapons Innovation and Joint System Development: A Case Study The Joint STARS program. (np.:np, 1997) 63.
22. Mackubin T. Owens, The Uses and Abuses of Jointness, "Marine Corps Gazette", November 1997, 54
23. Owen R. Cote, Associate Director of the MIT Security Studies Program, Interview by author, 25 April 2000. MIT, Cambridge, MA. Tape recording.

24. John Grin and others, Military Technological Innovation and Stability in a Changing World : Politically Assessing and Influencing Weapon Innovation and Military Research and Development. (Amsterdam : VU University Press, 1992), 6.
25. Owen R. Cote, Associate Director of the MIT Security Studies Program, Interview by author, 25 April 2000. MIT, Cambridge, MA. Tape recording.
26. Graham Ramsay, The Revolution in Military Affairs: A Primer for the Uninitiated. (Newport, RI: Naval War College. Center for Naval Warfare Studies. Strategic Research Department, 1996), 58.
27. Andrew Latham, Understanding the RMA : Braudelian Insights into the Transformation of Warfare. (Geneva, Switzerland: Programme for Strategic and International Security Studies, 1999), 14.
28. Peter Paret, Innovation and Reform in Warfare. (United States Air Force Academy, 1966), 7.
29. Robert L. Perry, Innovation and Military Requirements: A Comparative Study. (Santa Monica, Calif.: Rand Corp., 1967), 2-3.
30. Jan M. Van Tol, "Military Innovation and Carrier Aviation: An Analysis, Joint Force Quarterly." (Washington, DC: Institute for National Strategic Studies, NDU, Autumn-Winter 97/98), 102-103.
31. Emily O. Goldman and Richard B. Andres, "Systemic Effects of Military Innovation and Diffusion." <<http://www.Jciss.llnl.gov>> (9 March 2000), 19-21.
32. Mariann Jelinek, Institutionalizing innovation : A Study of Organizational Learning Systems. (New York: Praeger, 1979), 156.

33. Harvard Business School. Leaders on Leadership: Interviews with Top Executives. (Boston, MA: Harvard Business School Pub.1992), 202.
34. Michael H. Armacost, The Politics of Weapons Innovation: the Thor-Jupiter Controversy. (New York, Columbia University Press, 1969), 23.
35. Thomas E. Ricks and Anne Marie Squeo, "Why the Pentagon is Often Slow to Pursue New Weapons." Wall Street Journal. 12 October 1999, 2.
36. Thomas E. Ricks and Anne Marie Squeo, "Why the Pentagon is Often Slow to Pursue New Weapons." Wall Street Journal. 12 October 1999, 7.
37. Thomas E. Ricks and Anne Marie Squeo, "Why the Pentagon is Often Slow to Pursue New Weapons." Wall Street Journal. 12 October 1999, 3.
38. Max Weber, The Theory of Social and Economic Organization. New York: Free Press, 1947, 328.
39. Max Weber, From Max Weber: Essays in Sociology. (Oxford, UK: Oxford University Press, Inc. 1946).
40. Arthur J. Alexander, The Linkage Between Technology, Doctrine, and Weapons Innovation Experimentation For Use. (Santa Monica, Calif.: The Rand Corporation 1981), 19.
41. Steven P. Rosen, Professor of Political Science at Harvard, Interview by author, 25 April 2000. Harvard University, Cambridge, MA. Tape recording.
42. Graham Ramsay, The Revolution in Military Affairs: A Primer for the Uninitiated. (Newport, RI.: Naval War College. Center for Naval Warfare Studies. Strategic Research Department, 1996), 16-17.

43. Steven P. Rosen, Professor of Political Science at Harvard, Interview by author, 25 April 2000. Harvard University, Cambridge, MA. Tape recording.
44. Miller, William C. The Creative Edge: Fostering Innovation Where You Work. (Reading, Mass.: Addison-Wesley, 1987), 24-27.
45. Arthur J. Alexander, The Linkage Between Technology, Doctrine, and Weapons Innovation Experimentation For Use. (Santa Monica, Calif.: The Rand Corporation, 1981), 9.
46. Peter Ferdinand Drucker, Innovation and Entrepreneurship: Practice and Principles. (New York: Harper & Row, 1985), 232.
47. Daniel V. De Simone, Education for Innovation. (Oxford, New York, Pergamon Press 1968), 147.
48. Arthur J. Alexander, The Linkage Between Technology, Doctrine, and Weapons Innovation Experimentation For Use. (Santa Monica, Calif.: The Rand Corporation, 1981), 12.
49. Alexander, Arthur J. The Linkage Between Technology, Doctrine, and Weapons Innovation Experimentation For Use. Santa Monica, Calif.: The Rand Corporation, 1981), 13.
50. Alexander, Arthur J. The Linkage Between Technology, Doctrine, and Weapons Innovation Experimentation For Use. Santa Monica, Calif.: The Rand Corporation, 1981), 15.
51. Lawton, Robin L. Creating a Customer-Centered Culture: Leadership in Quality, Innovation, and Speed. (Milwaukee, Wis. ASQC Quality Press, 1993), 80-81.

52. Carl-Axel Gemzell, Organization, Conflict, and Innovation. A Study of German Naval Strategic Planning, 1888-1940, (Stockholm, Esselte Studium, 1973), 97.
53. Arthur J. Alexander, The Linkage Between Technology, Doctrine, and Weapons Innovation Experimentation For Use. (Santa Monica, Calif.: The Rand Corporation, 1981), 11-12.
54. Stephen P. Rosen, Winning the Next War. (Ithaca: Cornell University Press, 1991), 252.
55. Frederick George Bailey, Debate and Compromise; The Politics of Innovation, (Totowa, N.J., Rowman and Littlefield, 1973), 314.
56. Thomas E. Ricks and Anne Marie Squeo, "Why the Pentagon is Often Slow to Pursue New Weapons." Wall Street Journal. 12 October 1999, 1.
57. Owen R. Cote, Associate Director of the MIT Security Studies Program, Interview by author, 25 April 2000. MIT, Cambridge, MA. Tape recording.
58. Daniel V. De Simone, Education for Innovation. (Oxford, New York, Pergamon Press 1968), 148.
59. Peter Paret, Innovation and Reform in Warfare. (United States Air Force Academy, 1966), 7.
60. Arthur J. Alexander, The Linkage Between Technology, Doctrine, and Weapons Innovation Experimentation For Use. (Santa Monica, Calif.: The Rand Corporation 1981), 17-18.
61. Paul Bracken, " Sidewise Technology: a 21ST Century Driver." Lecture. Alternative Global Futures 2015 Workshop, Washington, D.C.: 27 September 1999, 1.
62. Paul Bracken, " Sidewise Technology: a 21ST Century Driver." Lecture. Alternative Global Futures 2015 Workshop, Washington, D.C.: 27 September 1999, 2.

63. Paul Bracken, "Sidewise Technology: a 21ST Century Driver." Lecture. Alternative Global Futures 2015 Workshop, Washington, D.C.: 27 September 1999, 2.
64. James D. Lang, Creativity and Innovation in Defense Technology and Strategy. (Washington, D.C. Industrial College of the Armed Forces, National Defense University, 1983), 42.
65. James D. Lang, Creativity and Innovation in Defense Technology and Strategy. (Washington, D.C. Industrial College of the Armed Forces, National Defense University, 1983), 43.
66. Vincent Davis, The Politics of Innovation: Patterns in Navy Cases. (Denver, University of Denver, 1967), 51-53.
67. Vincent Davis, The Politics of Innovation: Patterns in Navy Cases. (Denver, University of Denver, 1967), 55-56.
68. Vincent Davis, The Politics of Innovation: Patterns in Navy Cases. (Denver, University of Denver, 1967), 57-58.
69. Arthur J. Alexander, The Linkage Between Technology, Doctrine, and Weapons Innovation Experimentation For Use. (Santa Monica, Calif.: The Rand Corporation 1981), 19.
70. Robert K Yin, Organizational Innovation : A Psychologist's View. (Santa Monica, Calif.: Rand Corporation, 1978), 13.
71. Robert Dilts, and others. Tools for Dreamers: Strategies for Creativity and the Structure of Innovation. (Cupertino, Calif.: Meta Publications, 1991), 6.
72. Barry R. Posen, The Sources of Military Doctrine. (London: Cornell University Press Ltd., 1984) 7.

Bibliography

Books and Documents

Alexander, Arthur J. The Linkage Between Technology, Doctrine, and Weapons Innovation

Experimentation For Use. Santa Monica, Calif.: The Rand Corporation, 1981.

GC AS36 .R28 no. 6621

Armacost, Michael H. The politics of weapons innovation: the Thor-Jupiter controversy.

New York, Columbia University Press, 1969.

GC UA23 .A697

Bailey, Frederick George. Debate and Compromise; The Politics of Innovation.

Totowa, N.J., Rowman and Littlefield, 1973.

GC HC 240.9.T4 B33 1973b

Berger, Alexander. Organizational Innovation and Redesign in the Information Age: The Drug War, Net War, and Other Lower-End Conflict. 1997.

GC UA10.5 .B474 1997a

Bruins, Berend Derk. U.S. Naval Bombardment Missiles, 1940-1958 : A study of the Weapons Innovation Process. Ann Harbor: UMI, 1981.

GC V993 .B78 1988a

Christensen, Kerry Anne. Athens and the conquest of Salamis: Crisis, Competition and Innovation in the Saronic Gulf. 1993.

GC DE88 .C57 1993a

Cipolla, Carlo M. Guns, Sails and Empires; Technological Innovation and the Early Phases of European Expansion, 1400-1700. New York, Pantheon Books 1966.

GC UF565.E9 C5 1966

Cote, Owen. Precision Strike from the Sea : New Missions for a New Navy

Cambridge, Mass. Massachusetts Institute of Technology, 1998.

GC V214 .C683 1998

Crow, Michael M. and Bozeman, Barry. Limited by Design : R&D Laboratories in the U.S. national Innovation System. New York: Columbia University Press, 1998.

GC T176 .C76 1998

Davis, Vincent. The Politics of Innovation: Patterns in Navy Cases. Denver, University of Denver, 1967.

GC VF347 .D3

Dawson, Virginia P. Engines and Innovation : Lewis Laboratory and American Propulsion Technology. Washington, DC: U.S. G.P.O., 1991.

GC TL568.P76 D38 1991

De Simone, Daniel V. Education for Innovation. Oxford, New York, Pergamon Press 1968.

GC T62 .E3 1968.

Department of Defense DUSD, S&T. Joint Warfighting Science and Technology Plan. Washington, D.C.: 1999.

Dilts, Robert and others. Tools for Dreamers: Strategies for Creativity and the Structure of Innovation. Cupertino, Calif.: Meta Publications, 1991.

GC BF408 .D55 1991

Drucker, Peter Ferdinand, Innovation and Entrepreneurship: Practice and Principles. New York: Harper & Row, 1985.

GC HD2346 .U5 D78 1985

Ferrell, Mary Zey, Jerry Gaston and Arlene Parchman. Initiative and Innovation in the Soviet Military. College Station, Tex: 1984.

GC U600 .Z4 1984

Galbraith, Jay. Organizational Design. Menlo Park, CA: Addison-Wesley Publishing Co., 1977.

Gemzell, Carl-Axel. Organization, Conflict, and Innovation. A Study of German Naval Strategic Planning, 1888-1940. Stockholm, Esselte Studium, 1973.

GC VA513 .G44

Goldman, Emily O. "The U.S. Military in Uncertainty Times: Organizations, Ambiguity and Strategic Adjustment", Journal of Strategic Studies, June 1997, 41-74.

Harvard Business School. Leaders on Leadership : Interviews with Top Executives. Boston, MA: Harvard Business School Pub. 1992.

GC HD38.25.U6 L4 1992

Hayes, Brad C. and others. The Politics of Naval Innovation. Newport, RI: U.S. Naval War College. Center for Naval Warfare Studies. Strategic Research Department, 1994.

GC V420 P65 1994

Hill, Stephen W. Weapons Innovation and Joint System Development: A Case Study of the Joint STARS program. 1997.

GC UG485 .H555 1997a

Isaacson, Jeffery A. and others, Predicting Military Innovation. Santa Monica: Rand, 1999.

GC AS36 R293 242

Jelinek, Mariann. Institutionalizing innovation : A Study of Organizational Learning Systems. New York: Praeger, 1979.

GC HD45 .J38 1979

Lang, James D. Creativity and Innovation in Defense Technology and Strategy. Washington, D.C. Industrial College of the Armed Forces, National Defense University, 1983.

GC U393 .L36 1983a

Latham, Andrew. Understanding the RMA : Braudelian Insights into the Transformation of Warfare. Geneva, Switzerland: Programme for Strategic and International Security Studies, 1999.

GC UF500 .L37 1999

Lawton, Robin L. Creating a Customer-Centered Culture: Leadership in Quality, Innovation, and Speed. Milwaukee, Wis. ASQC Quality Press, 1993.

GC HF5415.5 .L39 1993

Meng, J. C. S. Fostering Innovation and Intrapreneurship in an R&D Organization. Newport, RI: Naval Undersea Warfare Division, 1995.

GC HD30.4 .M464 1995

Miller, William C. The Creative Edge: Fostering Innovation Where You Work. Reading, Mass.: Addison-Wesley, 1987.

GC HD53 .M55 1987

Neyberg, Eric N. and Smith, David P. Resource Allocation Volume I: The Formal Process. Newport, RI. U.S. Naval War College. 1999.

Paret, Peter. Innovation and Reform in Warfare. United States Air Force Academy, 1966.

GC U19 .P3

Perry, Robert L. Innovation and Military Requirements: A Comparative Study. Santa Monica, Calif.: Rand Corp., 1967.

GC AS36 .R29 no. 5182

Pinchot, Gifford. Intrapreneuring. New York: Harper & Row, 1985.

Posen, Barry R. The Sources of Military Doctrine. London: Cornell University Press Ltd.. 1984.

GC U162 .P66 1984

Princeton University. Dealing with Technological Change. Selected essays from Innovation. Princeton Auerbach Publishers 1971.

GC T21 D38

Ramsay, Graham. The Revolution in Military Affairs: A Primer for the Uninitiated. Newport, RI.: Naval War College. Center for Naval Warfare Studies. Strategic Research Department, 1996.

GC UA 25 R37 1996

Rosen, Stephen P. Winning the Next War. Ithaca: Cornell University Press, 1991.

GC UA23 .R758 1991

Yin, Robert K. Organizational Innovation : A Psychologist's View. Santa Monica, Calif.: Rand Corporation, 1978.

GC AS36 .R28 no. 6066

Weber, Max. The Theory of Social and Economic Organization. New York: Free Press, 1947

Voronkov, Lev Sergeevic, John Grin and Wim Smit. Military Technological Innovation and Stability in a Changing World : Politically Assessing and Influencing Weapon Innovation and Military Research and Development. Amsterdam : VU University Press, 1992.

GC U42 .M56 1992

Electronic Articles

Cerami, Joseph R. "Innovation in Policy Analysis [Draft]." <<http://www.awc.carlisle.army.mil>> (9 March 2000).

Emily O. Goldman and Richard B. Andres. "Systemic Effects of Military Innovation and Diffusion." <<http://www.Jciss.llnl.gov>> (9 March 2000).

Emily O. Goldman and Leslie C. Eliason, "Diffusion of Military Innovation." <<http://www.Jciss.llnl.gov>> (9 March 2000).

Ricks, Thomas E. "Joint Chiefs Tell Senate Military Faces Readiness Crisis, Needs Bigger Budget." Wall Street Journal. 30 September 1998.
<<http://www.infowar.com/iwftp/cspinney/c197.txt>> (28 February 2000).

Thomas E. Ricks and Anne Marie Squeo. "Why the Pentagon is Often Slow to Pursue New Weapons." Wall Street Journal. 12 October 1999.
<<http://ebird.dtic.mil/oct1999/e19991012whythe.htm>> (12 October 1999).

Wilson, George C. "Stuck on Super Weapons." Washington Post. 29 September 1998.
<<http://www.infowar.com/iwftp/cspinney/c197.txt>> (28 February 2000).

Unpublished Materials

Bracken, Paul, " Sidewise Technology: a 21ST Century Driver." Lecture. Alternative Global
Futures 2015 Workshop, Washington, D.C.: 27 September 1999

Cote, Owen R. Associate Director of the MIT Security Studies Program, Interview by
author, 25 April 2000. MIT, Cambridge, MA. Tape recording.

Ehrhard, Thomas P., Deputy Chief of Air Force Strategy, Concepts and Doctrine Division,
Interview by author, 13 March 2000. Pentagon, Washington, D.C. Tape recording.

Pennella, John J. Program Executive for the dod Counterdrug Technology Program Office,
Interview by author, 16 March 2000. NSWC, Dahlgren, VA. Tape recording.

Posen, Barry R. Professor of Political Science at MIT, Interview by author, 25 April 2000.
MIT, Cambridge, MA. Tape recording.

Rosen, Steven P. Professor of Political Science at Harvard, Interview by author, 25 April
2000. Harvard University, Cambridge, MA. Tape recording.

Williams, Robert M., to Joint Staff J8 Acquisition and Technology Division, 13 February
1998, SCIAD personal file, SCWD. Washington, D.C.

Williams, Robert M. Science Advisor United States Southern Command, Washington
Directorate, Interview by author, 20 March 2000. SCWD, Washington, D.C. Tape
recording.

Vita

**Captain Raymond V. Anderson, Jr.
USNR**

Captain Raymond Anderson is now completing his masters degree in Strategic Studies at the Naval War College in Newport Rhode Island. Upon completion of his masters, he will report for training as the Defense Attaché Designate for Lima, Peru.

Prior to his assignment at the Naval War College, he served over five years within the US Southern Command's Area of Responsibility. His military assignments included: Naval Special Warfare Unit Eight as a Special Projects Officer, US Southern Command J5 Planner, CINCLANTFLT Liaison Officer to US Southern Command, Naval Station Panama Canal Special Projects Officer and a Joint Inter-Agency Task Force South J5 Technology Planner. His travels included nine countries in the region.

In 1976 Captain Anderson was designated a Naval Aviator with experience in the A-4 and A-7E aircraft. His assignments until 1986 were at NAS Lemoore, CA, NAVCAMS WESTPAC Guam, MI (Dept. Head), NAS Whidbey Island, WA (Assistant OIC NAMTRAGRUDET), NAVFAC PT SUR and NAVFAC Centerville Beach, CA (Watch, Quality Assurance, Training and Operations Officer billets).

In 1986 Captain Anderson affiliated with ASWOC 1080 as a watch officer. In 1989 he transferred to NRMTF Puget Sound DET 822 where he held the positions of CO and XO.

His civilian assignments since 1986 have included Navy Morale



Welfare and Recreation Director (GS employee), Navy and Airforce Environmental Protection Specialist (GS), JIATF-S Planner (ASEC Contractor) and US Army South Department of Defense Intelligence Information Systems, DODIIS, Planner (GTE Contractor).

His education includes BS in business from the University of Maryland in 1975, JPME-1 from the U.S. Air University 1997. In addition, he has attended thirty-six other courses in a variety disciplines for more than thirty-five hundred hours of instruction.

He is the recipient of over twenty military awards including the Navy Commendation Medal, Navy Achievement Medal and Navy Meritorious Civilian Service Award.

Captain Anderson is married to the former Frances Louise Edge and has three daughters, Nikki, Sara and Kathryn and one son, John. He resides in Newport Rhode Island.